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## Site Environmental Report for 2009 Sandia National Laboratories, California



B.L. Larsen

Prepared by  
Sandia National Laboratories  
Livermore, California 94550

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# **Site Environmental Report for 2009 Sandia National Laboratories, California**

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## **ABSTRACT**

Sandia National Laboratories, California (SNL/CA) is a government-owned/contractor-operated laboratory. Sandia Corporation, a Lockheed Martin Company, operates the laboratory for the Department of Energy's National Nuclear Security Administration (NNSA). The NNSA Sandia Site Office oversees operations at the site, using Sandia Corporation as a management and operating contractor. This Site Environmental Report for 2009 was prepared in accordance with DOE Order 231.1A (DOE 2004a). The report provides a summary of environmental monitoring information and compliance activities that occurred at SNL/CA during calendar year 2009. General site and environmental program information is also included.

## Acknowledgements

This report was prepared by the Sandia National Laboratories, California Environmental Management Department, and reviewed and approved by the Department of Energy, National Nuclear Security Administration, Sandia Site Office. The author acknowledges the following key contributors to the content, review, and production of this report.

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# Contents

<b>1</b>	<b>EXECUTIVE SUMMARY.....</b>	<b>11</b>
1.1	OVERVIEW .....	11
1.2	ENVIRONMENTAL MANAGEMENT .....	11
1.3	PERFORMANCE MEASURES .....	11
1.4	ENVIRONMENTAL MONITORING.....	12
<b>2</b>	<b>INTRODUCTION.....</b>	<b>13</b>
2.1	HISTORY AND MISSION .....	13
2.2	LOCATION .....	13
2.3	SITE POPULATION .....	15
2.4	ENVIRONMENTAL SETTING .....	15
2.4.1	<i>Geology and Soils</i> .....	16
2.4.2	<i>Hydrology and Water Resources</i> .....	17
2.4.3	<i>Climate and Meteorology</i> .....	18
2.4.4	<i>Ecology</i> .....	19
<b>3</b>	<b>COMPLIANCE SUMMARY.....</b>	<b>21</b>
3.1	DOE ORDER 450.1A .....	21
3.2	DOE ORDER 430.2B .....	22
3.3	EXECUTIVE ORDER 13423.....	22
3.4	EXECUTIVE ORDER 13514.....	22
3.5	NATIONAL ENVIRONMENTAL POLICY ACT.....	22
3.6	AIR QUALITY .....	23
3.6.1	<i>Clean Air Act</i> .....	23
3.6.2	<i>Radionuclide Emissions</i> .....	24
3.7	NATURAL AND CULTURAL RESOURCES .....	24
3.7.1	<i>Endangered Species Act</i> .....	24
3.7.2	<i>Interim Protections for California Red-legged Frogs</i> .....	25
3.7.3	<i>Migratory Bird Treaty Act</i> .....	25
3.7.4	<i>Floodplain Management</i> .....	26
3.7.5	<i>Protection of Wetlands</i> .....	26
3.7.6	<i>National Historic Preservation Act</i> .....	26
3.8	ENVIRONMENTAL RESTORATION .....	27
3.8.1	<i>Comprehensive Environmental Response, Compensation, and Liability Act</i> .....	27
3.8.2	<i>Site Clean-up Orders</i> .....	27
3.9	HAZARDOUS MATERIALS .....	28
3.9.1	<i>Emergency Planning and Community Right-to-Know Act</i> .....	28
3.9.2	<i>California Hazardous Materials Release Response Plans and Inventory Law</i> .....	28
3.9.3	<i>Underground Storage Tanks</i> .....	28
3.9.4	<i>Toxic Substances Control Act</i> .....	28
3.9.5	<i>Federal Insecticide, Fungicide, and Rodenticide Act</i> .....	29
3.10	POLLUTION PREVENTION AND WASTE MINIMIZATION.....	29
3.10.1	<i>Pollution Prevention Requirements of DOE Order 450.1A</i> .....	29
3.10.2	<i>Hazardous Waste Source Reduction and Management Review Act</i> .....	30
3.10.3	<i>Pollution Prevention Act</i> .....	30
3.11	HAZARDOUS WASTE .....	31
3.11.1	<i>Federal Facility Compliance Act</i> .....	31
3.11.2	<i>Resource Conservation and Recovery Act</i> .....	31
3.11.3	<i>California Hazardous Waste Control Law</i> .....	31
3.11.4	<i>Medical Waste Management Act</i> .....	32
3.12	RADIATION PROTECTION.....	32
3.12.1	<i>Atomic Energy Act</i> .....	32
3.12.2	<i>DOE Order 435.1, Radioactive Waste Management</i> .....	32

3.12.3	DOE Order 5400.5, Radiation Protection of the Public and the Environment.....	33
3.13	WATER QUALITY AND PROTECTION.....	34
3.13.1	Clean Water Act.....	34
3.14	AUDITS, ASSESSMENTS, AND INSPECTIONS .....	35
3.15	ENVIRONMENTAL OCCURRENCES .....	36
3.16	PERMITS .....	37
<b>4</b>	<b>ENVIRONMENTAL MANAGEMENT .....</b>	<b>39</b>
4.1	EMS ELEMENTS .....	39
4.2	ENVIRONMENTAL PERFORMANCE .....	42
4.3	FUNCTIONAL ENVIRONMENTAL PROGRAM HIGHLIGHTS.....	55
4.3.1	Air Quality Program.....	55
4.3.2	Environmental Monitoring Program.....	56
4.3.3	Environmental Planning and Ecology Program.....	57
4.3.4	Hazardous Materials Management Program .....	58
4.3.5	Pollution Prevention and Waste Minimization Program.....	59
4.3.6	Waste Management Program .....	59
<b>5</b>	<b>ENVIRONMENTAL MONITORING .....</b>	<b>61</b>
5.1	STORM WATER.....	61
5.2	WASTEWATER.....	63
5.2.1	Sewer Outfall.....	64
5.2.2	Liquid Effluent Control System.....	65
5.2.3	Categorical Processes .....	66
5.3	GROUNDWATER .....	67
5.4	BIOLOGICAL DOSE ASSESSMENT.....	70
5.5	RADIATION MONITORING .....	70
<b>6</b>	<b>QUALITY ASSURANCE.....</b>	<b>73</b>
6.1	ENVIRONMENTAL MONITORING QUALITY ASSURANCE .....	73
6.2	ENVIRONMENTAL SAMPLING .....	73
6.3	SAMPLE ANALYSES .....	74
6.3.1	Accredited Laboratory.....	74
6.3.2	SNL/CA Health Physics Laboratory.....	74
6.3.3	SNL/NM Health Instrumentation Laboratory.....	74
6.4	DATA VERIFICATION AND VALIDATION .....	74
6.4.1	Quality Control Samples.....	74
6.4.2	Statistical Analyses .....	75
<b>7</b>	<b>REFERENCES.....</b>	<b>77</b>
<b>8</b>	<b>GLOSSARY.....</b>	<b>82</b>
<b>9</b>	<b>GROUNDWATER ANALYTICAL RESULTS, WELL COMPLETION DATA, AND SANITARY SEWER ANALYTICAL RESULTS .....</b>	<b>84</b>
<b>10</b>	<b>DISTRIBUTION LIST .....</b>	<b>93</b>

## Tables

Table 3-1 Status of EPCRA Reporting at SNL/CA, 2009 .....	28
Table 3-2 Order 5400.5 Compliance Summary, 2009 .....	33
Table 3-3 Wastewater Discharge Permit Exceedances at Sanitary Sewer Outfall, 2009 .....	34
Table 3-4 SNL/CA Audits, Assessments, and Inspections, 2009 .....	36
Table 3-5 SNL/CA Environmental Permits and Orders, 2009 .....	37
Table 4-1 Elements of the SNL/CA EMS Program.....	40
Table 4-2 Comparison of 2009 Operations with SWEA Envelope .....	57
Table 5-1 Summary of Analytical Results for Storm Water, 2008/2009 Wet Season.....	63
Table 5-2 Sewer Outfall Sampling Schedule, 2009.....	64
Table 5-3 Weekly Composite Sewer Outfall Monitoring Results – Physical Parameters and Metals, 2009.....	65
Table 5-4 Monitoring for Semiconductor Manufacturing Categorical Process, 2009 .....	66
Table 5-5 Groundwater Sampling Schedule, 2009 .....	68
Table 5-6 Summary of Groundwater Analyses at Navy Landfill, 2009 .....	68
Table 5-7 Summary of Groundwater Analyses at Arroyo Seco Wells, 2009 .....	69
Table 6-1 Summary of Statistical Analyses, 2009.....	76
Table 9-1 Results of Quarterly Groundwater Analyses at SNL/CA, 2009 .....	85
Table 9-2 Well Depth and Screen Period Interval.....	88
Table 9-3 Routine Monitoring Results for SNL/CA Sanitary Sewer Outfall, 2009 .....	89
Table 9-4 Routine Monitoring Results for SNL/CA Sanitary Sewer Outfall, 2009 (Method E200.8).....	90

## Figures

Figure 2-1 Regional Location Map .....	14
Figure 2-2 SNL/CA Site Map.....	15
Figure 2-3 SNL/CA Topography.....	16
Figure 2-4 Regional Earthquake Faults .....	17
Figure 2-5 Habitat at SNL/CA.....	19
Figure 4-1 Measurement of Excellence in Environmental Management.....	42
Figure 4-2 Weekly Composite Copper Concentrations in Wastewater .....	44
Figure 4-3 Weekly Composite Zinc Concentrations in Wastewater.....	44
Figure 4-4 Annual Wastewater Discharges .....	45
Figure 4-5 Constituents in Storm Water, 2008/2009 Rainy Season .....	46
Figure 4-6 Number of Vehicle Fill-ups on STA Days.....	47
Figure 4-7 Procurement of Environmentally Friendly Products.....	48
Figure 4-8 SNL/CA Hazardous Material Inventory .....	49
Figure 4-9 Hazardous Waste Generated at SNL/CA .....	50
Figure 4-10 Radioactive Waste Generated at SNL/CA .....	50
Figure 4-11 SNL/CA Landfill Waste .....	51
Figure 4-12 Recycled Scrap Metal, Paper, and Wood.....	52
Figure 4-13 Recycled Cardboard and Electronics .....	52
Figure 4-14 Small Quantity Recyclables .....	53
Figure 4-15 SNL/CA Energy Consumption .....	54
Figure 4-16 Water Consumption at SNL/CA .....	55
Figure 5-1 Storm Water Sampling Locations.....	62
Figure 5-2 Groundwater Monitoring Well Locations.....	67
Figure 5-3 Dosimeter Locations at SNL/CA and Around Site Perimeter.....	71
Figure 5-4 Dosimeter Locations in Livermore Valley.....	72

## **Preface**

Each year, Sandia National Laboratories, California (SNL/CA) prepares a summary report to provide environmental information to the local community, pursuant to the requirements of Department of Energy Order 231.1A. The Site Environmental Report for 2009 summarizes SNL/CA's compliance with environmental requirements, presents the results of monitoring and surveillance activities, and provides an update of site environmental programs.

The Site Environmental Report for 2009 was prepared for ease in readability. Each chapter focuses on a specific topic or area. Reference to other sections and chapters is made throughout the report to avoid redundancy. Detailed data is provided only when necessary to improve the presentation of information and the quality of the document. Acronyms are defined within each chapter as well as listed at the beginning of the report. References are compiled into one list and presented at the end of the document.



## Acronyms and Abbreviations

ALARA	as low as reasonably achievable
BAAQMD	Bay Area Air Quality Management District
CCR	California Code of Regulations
CARB	California Air Resources Board
CEARP	Comprehensive Environmental Assessment and Response Program
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CRMP	Cultural Resource Management Plan
DOE	Department of Energy
DTSC	Department of Toxic Substances Control (California)
EMS	environmental management system
EO	executive order
EPA	Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FONSI	Finding of No Significant Impact
General Permit	State of California, NPDES General Permit for Storm Water Discharge Associated with Industrial Activities
ISO	International Organization for Standardization
kg	kilogram
kg/yr	kilogram per year
LECS	liquid effluent control system
LLNL	Lawrence Livermore National Laboratory
MCLs	maximum contaminant levels
mg/L	milligrams per liter
mrem	millirem
MS4	California Small Municipal Separate Storm Sewer System
MSDS	material safety data sheet
mSv	milliSievert
ND	non-detectable
NEPA	National Environmental Policy Act
NESHAPs	National Emission Standards for Hazardous Air Pollutants
NFPA	National Fire Protection Association
NNSA	National Nuclear Security Administration

NNSA/SSO	National Nuclear Security Administration, Sandia Site Office
NPDES	national pollutant discharge elimination system
O&G	oil and grease
PCB	polychlorinated biphenyl
pCi/L	picocuries per liter
POTW	publicly owned treatment works
PP/WM	Pollution Prevention and Waste Minimization
QAPP	quality assurance program plan
RCRA	Resource Conservation and Recovery Act
RWQCB	Regional Water Quality Control Board (California)
SARA	Superfund Amendments and Reauthorization Act of 1986, Title III
Title III	
SHPO	State Historic Preservation Officer
SNL	Sandia National Laboratories
SNL/CA	Sandia National Laboratories, California
SNL/NM	Sandia National Laboratories, New Mexico
STA	Spare-the-Air
SWEA	site-wide environmental assessment
TPHD	total petroleum hydrocarbons diesel
TSCA	Toxic Substances Control Act
TSS	total suspended solids
µg/L	micrograms per liter
µmhos/cm	micromhos per centimeter
U.S.	United States
USC	United States Code
USFWS	United States Fish and Wildlife Service
UST	underground storage tank

# **1 Executive Summary**

## **1.1 Overview**

Sandia National Laboratories is one of three national laboratories supporting the United States Department of Energy (DOE) statutory responsibilities for nuclear weapon research and design, development of energy technologies, and basic scientific research. Sandia has facilities in New Mexico, California, Nevada, and Hawaii. Sandia National Laboratories, California (SNL/CA) is a multi-program engineering and science laboratory supporting the nuclear weapons stockpile program, energy and environment research, homeland security, micro- and nano-technologies, and basic science and engineering research.

The Site Environmental Report provides a summary of environmental management performance and compliance efforts at SNL/CA for calendar year 2009. The document also satisfies the DOE requirement for preparation of an annual environmental report, one of the required reports listed in *DOE Order 231.1A, Environment, Safety, and Health Reporting* (DOE 2004a).

The Site Environmental Report is divided into ten chapters. Chapter 1, the Executive Summary, highlights compliance and monitoring results obtained in 2009. Chapter 2 provides a brief introduction to SNL/CA and the existing environment found on site. Chapter 3 summarizes SNL/CA's compliance activities with the major environmental requirements applicable to site operations. Chapter 4 presents information on environmental management, performance measures, and environmental programs. Chapter 5 presents the results of monitoring and surveillance activities in 2009. Chapter 6 discusses quality assurance. Chapters 7 through 9 provide supporting information for the report and Chapter 10 is the report distribution list.

## **1.2 Environmental Management**

Sandia maintains a comprehensive environmental management system (EMS) that incorporates environmental stewardship, compliance, and a process of continual improvement. SNL/CA's program conforms to the international standard for EMS, ISO 14001 (ISO 2004), obtaining re-registration on July 5, 2009. SNL/CA is also a Waste Wise Partner (April 2008), a program sponsored by the Environmental Protection Agency. Additional information on environmental management is presented in Chapter 4.

## **1.3 Performance Measures**

SNL/CA measures environmental performance as progress towards achieving EMS objectives and contract performance measures established jointly between Sandia and the DOE National Nuclear Security Administration, Sandia Site Office (NNSA/SSO). During 2009, SNL/CA measured performance in achieving 14 EMS objectives and one NNSA/SSO performance measure. SNL/CA received three notices of violation in 2009 for exceedances

of copper and zinc in the wastewater stream. Section 3.13 presents the details of these violations. Section 4.2 provides additional information about SNL/CA's environmental performance in 2009.

## **1.4 Environmental Monitoring**

SNL/CA monitors storm water, wastewater, groundwater, and direct (ambient) radiation. The results of monitoring show that no pollutants were detected in storm water runoff at levels that are a cause for concern. SNL/CA experienced three exceedances of the wastewater discharge limit at the sewer outfall during 2009 (two for copper and zinc, one for copper only). SNL/CA continued to see carbon tetrachloride in groundwater at the Navy Landfill in 2009 with a concentration similar to that detected in past years. Wells at the Fuel Oil Spill site had insufficient water to sample during 2009; consequently, no samples were collected. Monitoring data indicate that SNL/CA is not contributing significantly to the external radiation dose in the area. The average annual gamma radiation dose from all sources including background radiation at the site perimeter was 61.8 mrem (0.62 mSv), which is within the dose range measured over the last fifteen years. The measured background for this area is approximately 56.2 (0.56 mSv). The difference between the two values is not statistically significant. Additional information about environmental monitoring at SNL/CA is provided in Chapter 5.

## 2 Introduction

### 2.1 History and Mission

Sandia National Laboratories, California (SNL/CA) was established in 1956 by Sandia Corporation to provide a closer relationship with Lawrence Livermore National Laboratory (LLNL) and their nuclear weapons design work. The SNL/CA facility evolved into an engineering research and development laboratory by the early 1960s, and into a multi-program engineering and science laboratory during the 1970s. As international arms control efforts increased in the late 1970s and throughout the 1980s, the United States emphasized treaty monitoring, safety, security, and control of the national nuclear weapons stockpile. With the end of the Cold War in the late 1980s, the role of SNL/CA to support stockpile stewardship ensuring nonproliferation and continued safety, security, and reliability, took on greater importance.

#### Research Activities at SNL/CA

- Science-based performance and reliability testing and computer-based modeling of nuclear weapon components
- Development, design, and testing of nonnuclear components for nuclear weapon systems
- Development and testing of materials and diagnostic equipment in support of defense programs, homeland security, and basic science and engineering
- Energy and environmental research
- Research and development of microelectronics, microsystems, and nanotechnologies

SNL/CA has provided distinguished service to the nation for over 50 years through engineering support and systems integration for nuclear weapons and related national security research and development efforts. Our programs support four key areas – the national nuclear deterrence policy and stockpile security, nonproliferation and materials control, energy and critical infrastructure, and emerging threats. SNL/CA is committed to collaborative research and development with industry and universities, resulting in new and enhanced technologies that have both commercial and national security benefits.

SNL/CA is a government owned/contractor operated laboratory. The site, the buildings, and the equipment are owned by the government; while Sandia Corporation, a Lockheed Martin Company, operates the laboratory for the Department of Energy's National Nuclear Security Administration (NNSA). The NNSA/Sandia Site Office (NNSA/SSO) oversees the operations at the site, using Sandia Corporation as a management and operating contractor.

### 2.2 Location

SNL/CA is located approximately 40 miles east of San Francisco, near the City of Livermore in eastern Alameda County. The site lies at the western base of the Altamont Hills on relatively flat terrain with low relief sloping gently northwest and north. Figure 2-1 shows the regional location of the site.

SNL/CA occupies 410 acres. The main campus (134 acres) is surrounded by the remaining undeveloped SNL/CA land (276 acres) on the east, south, and west (Figure 2-2, Site Map). To the north of SNL/CA are East Avenue and LLNL. Land use to the east and south of the site is agricultural and low-density residential. A residential development is located along the western boundary of the site.



Figure 2-1 Regional Location Map

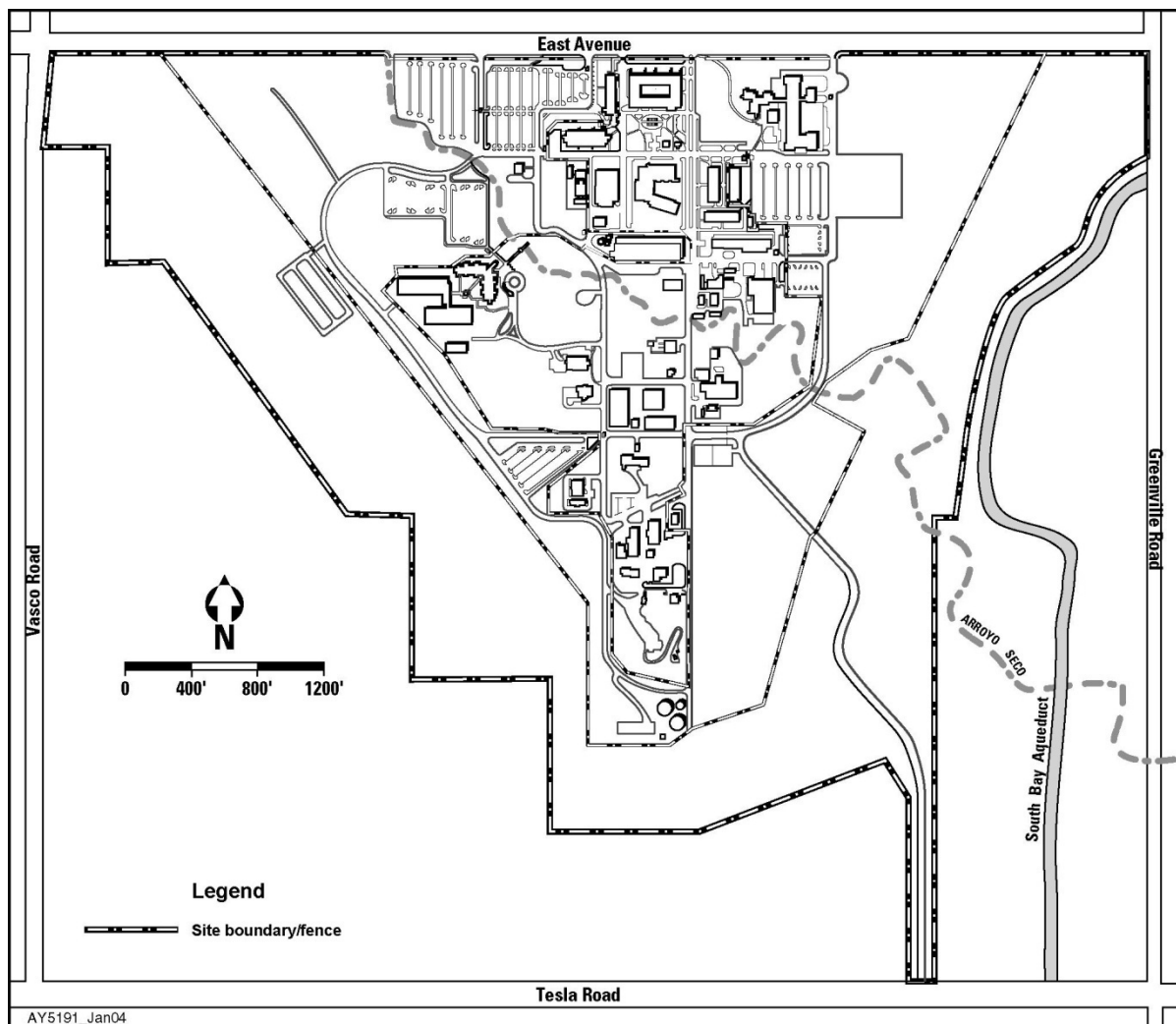


Figure 2-2 SNL/CA Site Map

## 2.3 Site Population

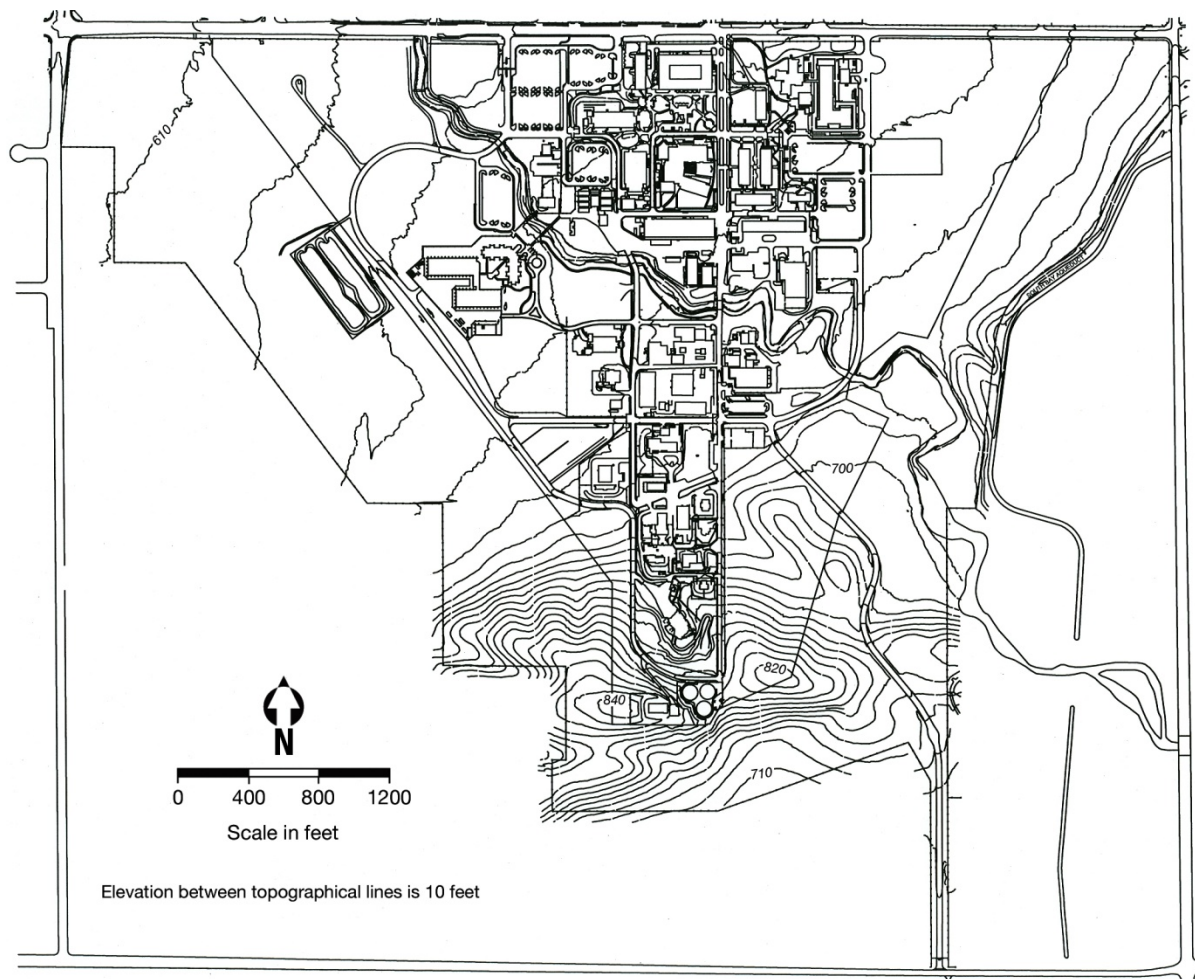
The SNL/CA workforce is comprised of Sandia employees (full and part-time staff, student interns, and post-doctoral appointees) and contracted staff. In December 2009, there were 988 Sandia employees working at SNL/CA, an increase of 16 from 2008. Eighty-four percent of Sandia employees live in Alameda, Contra Costa, and San Joaquin counties. Thirty-six percent live in Livermore. The contracted workforce fluctuates throughout the year depending on program staffing needs. An estimate of contracted staff is not available.

## 2.4 Environmental Setting

The following summarizes the environmental setting at SNL/CA. Additional information can be found in the *Final Site-wide Environmental Assessment of the Sandia National Laboratories/California* (DOE 2003a).

## 2.4.1 Geology and Soils

SNL/CA is located in the California Coast Ranges geologic province in the southeastern portion of the Livermore Valley. The valley forms an irregularly shaped lowland area about 16 miles long, east to west, and 7 to 10 miles wide, north to south. The land at SNL/CA slopes gently to the northwest and north, with steep terrain in the southern portion of the site and along the banks of Arroyo Seco. The site ranges in elevation from 615 feet above mean sea level at the northwest corner of the property to 849 feet at the southern end. Site topography is depicted on Figure 2-3.

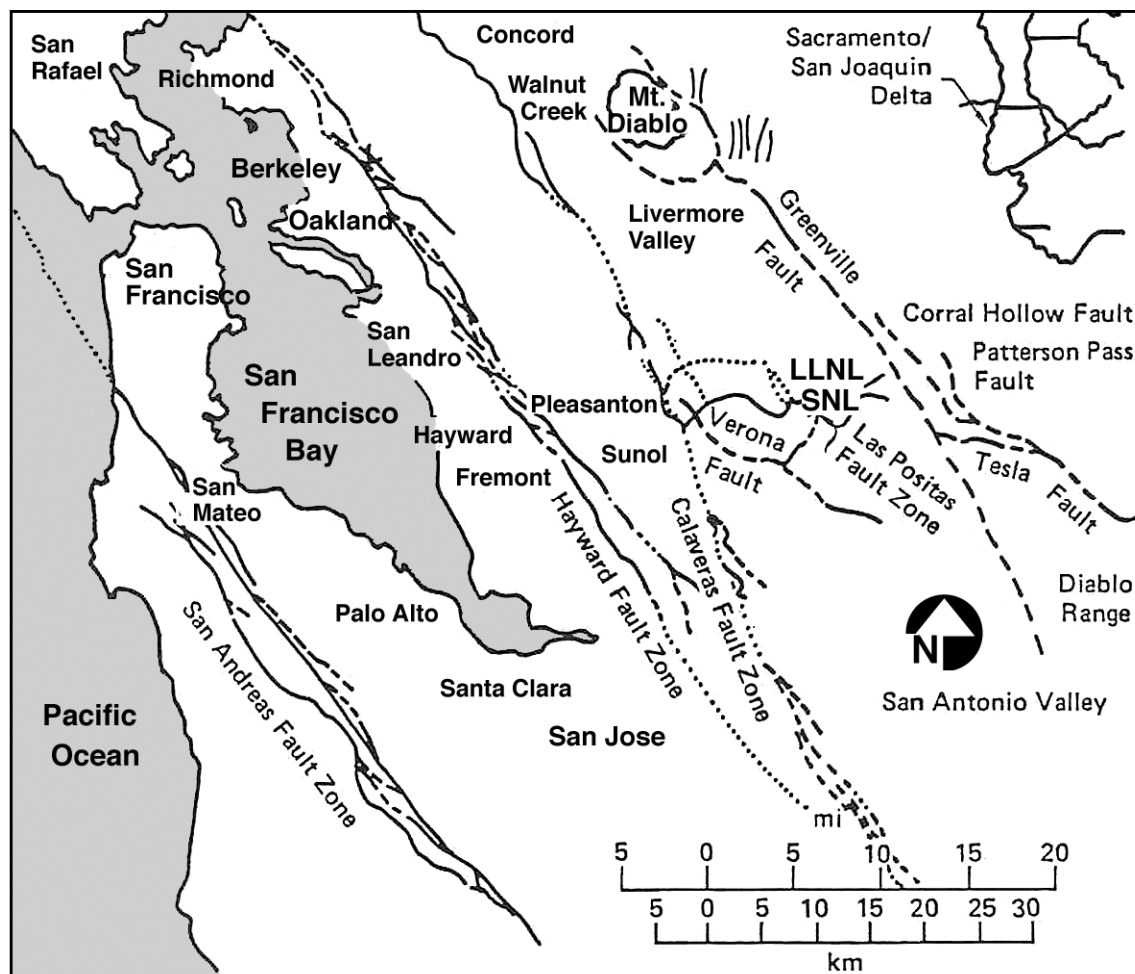


**Figure 2-3 SNL/CA Topography**

SNL/CA is located in a seismically active region. The major fault systems in the area are the San Andreas Fault system and the much older Coast Range thrust fault system. The upper plate of the Coast Range thrust formed the northwest trending Coast Range, including the Altamont Hills. Any seismic activity in the Livermore Valley would probably result from movement on the San Andreas Fault, a right-lateral strike-slip fault system trending northwest-southeast, extending from Point Arena to the Gulf of California. The regional faults closest to SNL/CA, the Hayward, Calaveras, Greenville, and Tesla faults follow this trend, and have been seismically active in the historic past. A magnitude 5.8 earthquake on



the Greenville fault in 1980 caused minor damage at SNL/CA and in the Livermore Valley. The Las Positas fault crossing SNL/CA is a transverse fault, at right angles to the Greenville fault, and was active during this earthquake. The Verona fault is a low angle thrust fault, dissimilar to the regional faulting, and probably not connecting with either the Calaveras or Las Positas faults. Only microseismicity was recorded on the Verona fault in 1980. These faults are shown on Figure 2-4.



**Figure 2-4 Regional Earthquake Faults**

Surface soils and arroyo sediments cover the SNL/CA site. Underlying soils at the site are formed primarily upon sediments deposited by local streams. Three soils cover most of SNL/CA: Rincon clay loam, Positas gravelly loam, and Livermore gravelly loam. There are no known mineral resources or fossil occurrences at the site.

## 2.4.2 Hydrology and Water Resources

Groundwater in the SNL/CA area occurs within saturated unconsolidated geologic material. Depth to groundwater varies from less than 20 feet on the eastern portion of the site to 126 feet on the west side of the site. Water bearing-units beneath the site are composed of shallow heterogeneous, unconsolidated alluvium and deep fluvial and lacustrine sediments.

Groundwater near SNL/CA is generally suitable for use as domestic, municipal, agricultural, and industrial supply. However, some shallower groundwater may be of marginal quality and not suitable for industrial or agricultural purposes. Groundwater less than 300 feet deep is usually unsuitable for domestic use without treatment.

SNL/CA purchases potable water from LLNL, which is supplied by the San Francisco Water District through the Hetch Hetchy Aqueduct. Additionally, the Alameda County Flood Control and Water Conservation District, Zone 7, supplements this primary water source as needed. SNL/CA's water use is metered by LLNL as it enters the site. In calendar year 2009, SNL/CA used 59.56 million gallons of water, a decrease of approximately 5.35 million gallons from water used in 2008. (See discussion in Section 4.2). The site discharged approximately 16.37 million gallons of wastewater during the year. Water loss, or the difference between water use and wastewater discharge, is attributed to irrigation, cooling towers, water tank releases, evaporative losses, eyewash and safety shower testing, and fire system testing.

There are no perennial streams or natural surface water bodies at SNL/CA. The Arroyo Seco, an ephemeral and intermittent stream, diagonally traverses the site from southeast to northwest. The arroyo typically flows only in very wet years, and for short periods of time during heavy storms. A seasonal wetland that is wet well into June, and sometimes July, is located in the streambed along the eastern part of the arroyo. Storm water runoff at SNL/CA is conveyed to Arroyo Seco through a system of storm drains and channels. The Arroyo Seco and seasonal wetland are shown on Figure 2-5.

### **2.4.3 Climate and Meteorology**

The climate at SNL/CA is typical of the Mediterranean conditions in the San Francisco Bay region where cool, wet winters and hot, dry summers are normal. In the summer, inland valleys, such as the Livermore Valley, generally experience more sunshine and higher temperatures than the coastal areas. In the winter, temperatures in the valley are usually cooler than at the coast.

Annual meteorological data for 2009 was obtained from the LLNL meteorological tower (LLNL 2010).<sup>1</sup> The annual rainfall for 2009 was 12.11 inches. Temperatures in 2009 ranged from 26.8 to 104.9° Fahrenheit. Average annual rainfall in the Livermore area over the last five years was 12.64 inches. The windiest months in the area occur in the spring and summer, and are dominated by westerly sea breezes. The winds during the fall and winter are typically lighter and more varied in direction.

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<sup>1</sup> The SNL/CA meteorological tower does not collect accurate rainfall data; therefore, this report presents data from the LLNL tower.

## 2.4.4 Ecology

### *Plant Species*

The plant community at SNL/CA is typical of the surrounding region, consisting primarily of grassland. Localized areas of coyote brush scrub, willow riparian woodland, and wetland habitat are also present. Areas developed and disturbed by Sandia operations constitute an additional habitat type, designated altered habitat. Habitat types are depicted on Figure 2-5. No threatened, endangered, proposed, or candidate plant species are present onsite.

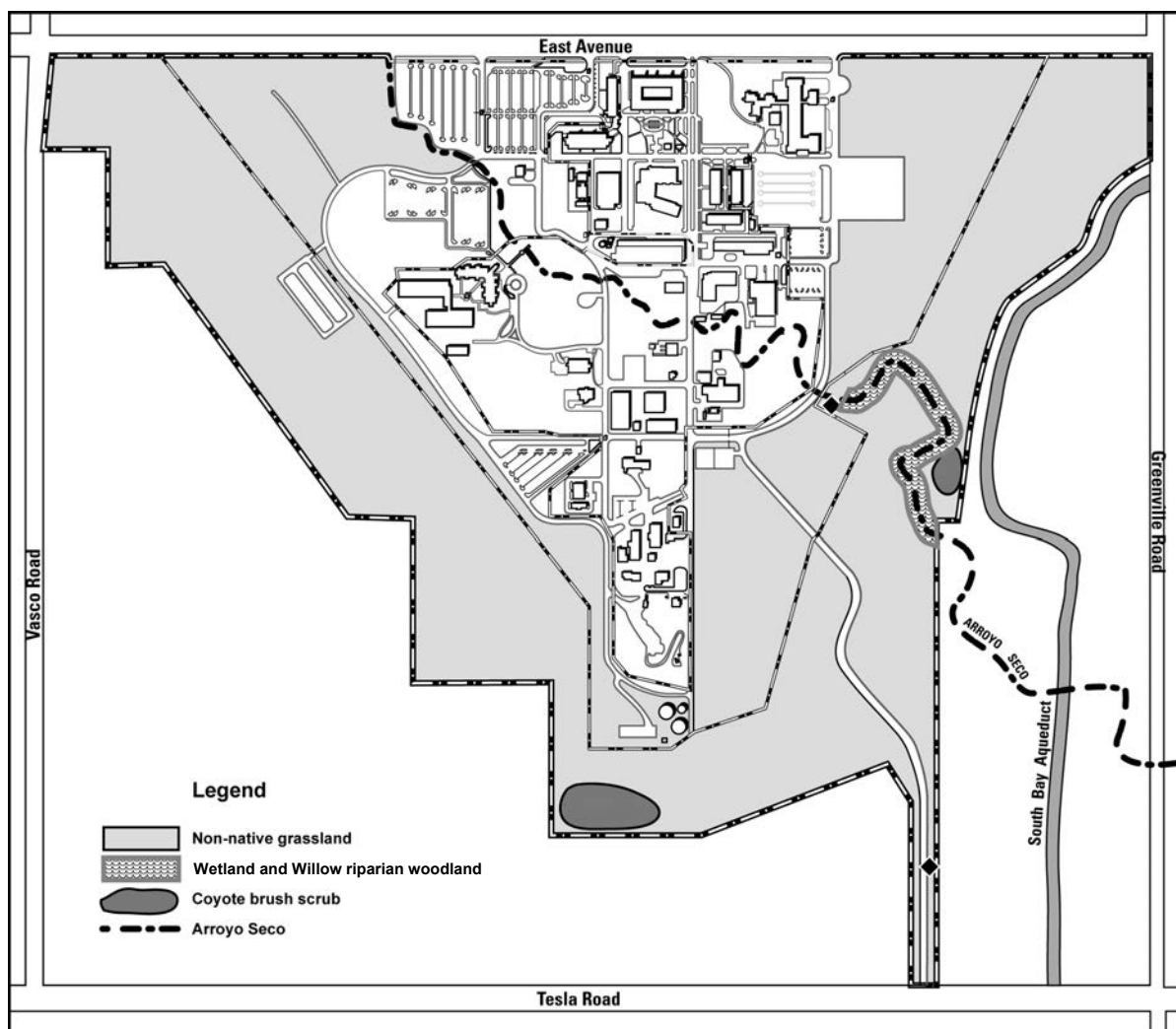


Figure 2-5 Habitat at SNL/CA

### *Wildlife Species*

A variety of wildlife species live and forage at SNL/CA. During 2009, SNL/CA identified 66 bird species, one amphibian, three reptiles, and 20 mammal species on site. SNL/CA is located within the range of the mountain lion (*Puma concolor*), a “specially protected

mammal” under California law. The most recent sighting of a mountain lion was reported at SNL/CA in 2008. Passive monitoring at the site for visiting mountain lions is ongoing.

SNL/CA provides habitat (or potential habitat) for two threatened wildlife species, the California red-legged frog (*Rana aurora draytonii*) and the California tiger salamander (*Ambystoma californiense*). The most recent confirmed observation of a tiger salamander at SNL/CA was on December 13, 2007, when an adult salamander was found within the developed area of the site. The first confirmed observation of California red-legged frogs at SNL/CA occurred in April 2004 when several individuals were found on the eastern portion of the site in shallow water contained within Arroyo Seco. California red-legged frogs were observed during 2005 and 2006, but not since. Over the last three years, California has experienced drought conditions resulting in less runoff to Arroyo Seco and shorter periods of ponded water. In recent years, SNL/CA has observed a decrease in the numbers of water invertebrates and Pacific tree frogs found in and along Arroyo Seco. Early drying of shallow pools and the decrease in prey contribute to the absence of California red-legged frogs at SNL/CA in 2009.

Numerous bird species nest or forage on site, most of which are protected under the Migratory Bird Treaty Act.

Several birds are also Federal and/or state special concern species or fully protected in California. These include the Black throated sparrow (*Amphispiza bilineata*), Western burrowing owl (*Athene cunicularia*

*hypugaea*), Ferruginous hawk (*Buteo regalis*), Nuttall’s woodpecker (*Picoides nuttallii*), Oak titmouse (*Parus inornatus*), Tri-colored blackbird (*Agelaius tricolor*), Yellow warbler (*Dendroica petechia*), White-tailed kite (*Elanus leucurus*), Golden eagle (*Aquila chrysaetos*), and Loggerhead shrike (*Lanius ludovicianus*). Of these special concern species, the Loggerhead shrike and the Nuttall’s woodpecker were the only ones nesting at SNL/CA in 2009.



## 3 Compliance Summary

Sandia National Laboratories, California (SNL/CA) operates in compliance with the letter and spirit of applicable federal, state, and local environmental laws and regulations. Additionally, as a Department of Energy (DOE) facility, the site is subject to DOE directives (DOE orders), and to presidential executive orders. This chapter provides a summary of SNL/CA compliance with major environmental requirements for calendar year 2009.

### 3.1 DOE Order 450.1A

*DOE Order 450.1A, Environmental Protection Program* (DOE 2008b) outlines the basic strategy for environmental compliance at DOE facilities, including SNL/CA. The objectives of Order 450.1A are to implement sound environmental stewardship practices, and to meet or exceed compliance with environmental, public health, and resource protection laws, regulations, and DOE requirements (DOE 2008b). The order requires DOE sites to meet these objectives through an environmental management system (EMS) that integrates environment, safety, and health into work planning and execution.

Sandia implemented its EMS in December 2005, the DOE established deadline. In 2006, SNL/CA upgraded the EMS Program to conform to the international standard for EMS, ISO 14001:2004, and received third-party registration to the standard. In 2009, SNL/CA received re-registration to the ISO 14001:2004 standard for an additional three-year period. Chapter 4 provides additional information on SNL/CA's EMS program.

DOE Order 450.1A also establishes five sustainable environmental stewardship goals. Sandia incorporates these goals into ongoing operations through six functional environmental programs (See Chapter 4) and implements specific activities in support of DOE's goals through the EMS. SNL/CA's progress in meeting sustainable environmental stewardship goals is presented in *Section 4.2 Environmental Performance*. SNL/CA does not keep data on reductions in ozone depleting substances (ODS) in use at the site. However, SNL/CA complies with the DOE's goals and the regulations contained in 40 CFR 82 that are designed to end production of ODS, support recycling of ODS during servicing and disposal of equipment, and identify alternatives for ODS. These compliance activities are coordinated through the Air Quality Program.

#### **DOE Order 450.1A Sustainable Environmental Stewardship Goals**

- *Reduce generation /toxicity of hazardous waste at the source through pollution prevention*
- *Reduce/eliminate acquisition of toxic and hazardous chemicals and materials*
- *Purchase environmentally preferable products*
- *Practice electronic stewardship*
- *Recycle*

## **3.2 DOE Order 430.2B**

*DOE Order 430.2B, Departmental Energy, Renewable Energy and Transportation Management* (DOE 2008a) identifies requirements and responsibilities for efficient and effective management of energy, water, and vehicle fleets at DOE facilities. Order 430.2B requires DOE sites to incorporate objectives and targets into their EMS programs that contribute to achieving sustainable goals for energy, water, and fleet management.

SNL/CA's EMS Program includes objectives for energy use, water use, and general transportation. Site-specific, long-term targets have been established for the water use and general transportation objectives. Energy targets are identified in the corporate EMS Program for implementation across all Sandia sites. Chapter 4 provides additional information on EMS metrics related to energy, water, and transportation.

## **3.3 Executive Order 13423**

Issued in January 2007, *Executive Order 13423, Strengthening Federal Environmental, Energy, and Transportation Management (EO 13423)* sets goals in the areas of energy efficiency, acquisition, renewable energy, toxics reductions, recycling, sustainable buildings, electronics stewardship, fleets, and water conservation. EO 13423 also requires more widespread use of environmental management systems as the framework in which to manage and continually improve these sustainable practices. The requirements of EO 13423 are implemented through DOE Order 450.1A and DOE Order 430.2B.

## **3.4 Executive Order 13514**

*Executive Order 13514, Federal Leadership in Environmental, Energy, and Economic Performance* was issued on October 5, 2009. EO 13514 establishes an integrated strategy towards sustainability in the Federal government and makes reduction of greenhouse gas emissions a priority for Federal agencies. The order identifies specific requirements for reducing consumption of petroleum fuel, water resources, and paper; recycling of solid waste (including construction debris); and procurement of postconsumer, low-toxicity, and sustainable products. To support requirements of the order, SNL/CA modified targets for water use and affirmative procurement (see Section 4.2) and established new targets for on-site transportation and solid waste. Monitoring and measurement for the new targets (reduce use of transportation fuels, continue diversion of trash and construction debris from disposal to recycling / reuse) will begin in fiscal year 2010 and data will be reported in future site environmental reports. Additional targets for reducing energy use and green house gas emissions will likely be developed in 2010.

## **3.5 National Environmental Policy Act**

The National Environmental Policy Act (NEPA) (42 USC § 4321) is the basic national charter for protection of the environment. It requires all federal agencies to evaluate the affects of major federal actions on the human environment, including the physical,

socioeconomic, and cultural environments. NEPA review of DOE actions is conducted in accordance with *DOE NEPA Implementing Procedures* (10 CFR 1021). Under these procedures, DOE may prepare a programmatic (including site-wide) document at any time to further the purposes of NEPA. In 2003, DOE's National Nuclear Security Administration/Sandia Site Office (NNSA/SSO) issued a site-wide environmental assessment (SWEA) for continued operations at SNL/CA (DOE 2003a) and a Finding of No Significant Impact (FONSI) on March 20, 2003 (DOE 2003b). The SWEA evaluates the impacts of site operations over the next ten years, and the FONSI concludes that continuation of site operations is not a major federal action significantly affecting the quality of the human environment.

SNL/CA supports compliance with NEPA and DOE's NEPA Implementing Procedures by reviewing all new projects and programs or changes to existing projects and programs to ensure that they fit within the bounds of existing NEPA documents and impact analyses for the site. The SNL/CA NEPA review process is documented in an administrative procedure (SNL/CA 2008a) that is reviewed and updated every three years, or as needed. During fiscal year 2009, 130 projects underwent NEPA review. None of these projects required preparation of an environmental assessment or environmental impact statement.

## **3.6 Air Quality**

### **3.6.1 Clean Air Act**

The Clean Air Act (42 USC § 7401) is the federal statute that forms the basis for the national air pollution control effort. It authorizes the Environmental Protection Agency (EPA) to promulgate air quality regulations and establishes national ambient air quality standards for criteria pollutants. Authority to implement the requirements of the Clean Air Act is provided to each state that has an EPA approved State Implementation Plan. The State Implementation Plan for California describes how National Ambient Air Quality Standards will be obtained in each air district. Each district establishes and enforces air pollution regulations to attain and maintain state and federal ambient air quality standards. The Bay Area Air Quality Management District (BAAQMD) is the regulating authority for controlling air pollution from stationary sources at SNL/CA. The California Air Resources Board (CARB) is responsible for ensuring that federal and state standards are met for mobile and small "area" sources of air pollution.

SNL/CA does not have any major sources of air pollutants (as defined in 40 CFR Part 70.2) present on site. SNL/CA works with the BAAQMD and CARB to permit or register all regulated emission sources. There were 15 permitted sources for the 2008/2009 permitting period<sup>2</sup> and 13 permitted sources for the 2009/2010 permitting period. Table 3-5 (Section 3.16) provides a list of the permitted sources.

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<sup>2</sup> The BAAQMD permit period is July 1 through June 30 each year. Permit data is presented for the two periods applicable to 2009.

## 3.6.2 Radionuclide Emissions

The *National Emissions Standards for Hazardous Air Pollutants, Subpart H – National Emission Standards for Emissions of Radionuclides Other Than Radon From Department of Energy Facilities* (NESHAPs) (40 CFR Part 61) establishes radiation protection standards, monitoring requirements, and annual reporting of radionuclide air emissions. Additional requirements pertaining to radionuclide emissions are contained in *DOE Order 450.1A, Environmental Protection Program* (DOE 2008b), and *DOE Order 5400.5, Radiation Protection of the Public and the Environment* (DOE 1993).

SNL/CA does not currently have any radionuclide emission sources that are subject to the monitoring requirements of 40 CFR Part 61. To comply with national emission standards, SNL/CA evaluates individual projects with the potential to release radionuclide emissions to determine the worst-case dose to the public. Additionally, dose calculations are compared to the requirements to determine the need for annual monitoring. During 2009, there were no projects using radionuclides above the Annual Possession Quantity; consequently, SNL/CA did not complete any NESHAPs evaluations.

## 3.7 Natural and Cultural Resources

### 3.7.1 Endangered Species Act

The Endangered Species Act (16 USC § 1531 et. seq.) provides for protection of plant and wildlife species in danger of becoming extinct. In 2002, NNSA/SSO and SNL/CA initiated consultation with the U.S. Fish and Wildlife Service (USFWS) under Section 7 of the Endangered Species Act for maximum operations of the SNL/CA site. On December 8, 2004, the USFWS issued a biological and conference opinion for continued operations at SNL/CA. The biological opinion concludes that proposed site operations are not likely to jeopardize the continued existence of the California red-legged frog (*Rana aurora draytonii*) and the California tiger salamander (*Ambystoma californiense*), the two threatened species present on site. The conference opinion concludes that site operations are not likely to destroy or adversely modify proposed critical habitat for the red-legged frog<sup>3</sup>.

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<sup>3</sup> In 2002, when the consultation process began, the Sandia site was within designated critical habitat for the California red-legged frog. In November 2002, the designation was overturned (U.S. District Court 2002), and in April 2004, the USFWS re-issued proposed critical habitat that included the Sandia site (USFWS 2004). However, in November 2005, the USFWS issued a revised designation (USFWS 2005), and a final rule in April 2006 (USFWS 2006). Under the 2006 final designation, the Sandia site is not included in the critical habitat area. The USFWS issued a proposed revision to critical habitat again in September 2008. As of 2009 end, a final critical habitat rule has not been issued.



A man-made recharge basin consisting of two cells encompassing approximately 2.7 acres, is located in the west outer perimeter area at SNL/CA. Lawrence Livermore National Laboratories (LLNL) constructed the basin in 1989 to serve as a recharge basin for their groundwater treatment program. LLNL discontinued use of the basin in 2003 and terminated its agreement with SNL/CA for use of the area in June 2005. In October 2008, SNL/CA and NNSA/SSO submitted a request for amendment of the biological opinion to the USFWS. The proposal included backfilling of the basin and designation of

an additional ten acres for future construction. To offset the ten-acre construction area, SNL/CA and NNSA/SSO identified an additional 30 acres for inclusion in the site's wildlife reserve. SNL/CA and NNSA/SSO met with the USFWS in December 2008 to discuss the proposed action and mitigation. In May 2009, the USFWS indicated that 30-acre of upland habitat would not be sufficient mitigation and suggested construction of a pond. SNL/CA and NNSA/SSO discontinued discussions with USFWS on the proposal because construction of a pond is not feasible at the site and resources are not available to support offsite mitigation. No further action is planned for the empty recharge basin.



### **3.7.2 Interim Protections for California Red-legged Frogs**

In October 2006, interim restrictions on pesticide use went into effect to protect the California red-legged frog. The restrictions are the result of a settlement agreement between the EPA and the Center for Biological Diversity that requires the EPA to consult with the USFWS under the Endangered Species Act on the impacts of 66 pesticide ingredients to the red-legged frog. The agreement, outlined in a Stipulated Injunction and Order (US District Court 2006), places restrictions on the use of these pesticides in red-legged frog aquatic and upland habitat until consultations are complete and biological opinions are issued by the USFWS. In response to these interim protections, SNL/CA has restricted the use of products containing the named pesticide ingredients in and along Arroyo Seco. As of December 31, 2009, the EPA completed effects determinations (or canceled the registration) for all 66 pesticide ingredients but no opinions have been issued.

### **3.7.3 Migratory Bird Treaty Act**

The Migratory Bird Treaty Act (16 USC §703 et. seq.) provides for protection of migratory birds, their nests, and eggs. Sixty of the 66 bird species observed at SNL/CA in 2009 are protected under this act. In 2009, there was no intentional take of migratory birds or disturbance to nests or eggs at the site. Migratory birds often build nests within the developed campus in locations where they will be disturbed by maintenance activities. To avoid harming birds, nests, or eggs, SNL/CA delays activities until the young have fledged, or surveys determine that the nest is abandoned. In 2009, three maintenance activities were delayed to protect nesting birds.

### 3.7.4 Floodplain Management



**Arroyo Seco Improvement Project - 2009**

*Executive Order 11988, Floodplain Management* (EO 11988), requires federal agencies to consider impacts associated with the occupancy and modification of floodplains, to reduce the risk of flood loss, to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by floodplains. In 2002, SNL/CA completed a management plan for the Arroyo Seco to identify channel improvements and stream zone management activities that will reduce flood and erosion risk and provide improved habitat for

wildlife species that may use the arroyo (Matthews 2002). The plan identifies areas for constructing functional floodplains and for planting of native riparian vegetation. During 2006 and 2007, SNL/CA completed five improvement tasks under a two-year permit issued by the U.S. Army Corp of Engineers. SNL/CA submitted a new permit request in 2006 for the remaining improvement actions. In September 2008, SNL/CA received a new ten-year permit from the U.S. Army Corp of Engineers to continue the Arroyo Seco Improvement Program. Nine improvement projects were completed in 2009.

### 3.7.5 Protection of Wetlands

*Executive Order 11990, Protection of Wetlands* (EO 11990), requires federal agencies to minimize the destruction, loss, or degradation of wetlands and preserve and enhance the natural and beneficial values of wetlands. A small wetland area of 0.44 acres is present at SNL/CA. During 2009, SNL/CA did not conduct any activities in the wetland area, or affecting wetlands.

### 3.7.6 National Historic Preservation Act

The National Historic Preservation Act (16 USC § 470) requires federal agencies to identify, record, and protect cultural resources. In 1990, an assessment of cultural resources at the SNL/CA site was completed. Although no prehistoric resources, Native American resources, or historic archaeological sites were identified during this assessment, there is a possibility that buried resources could be present on site (DOE 2003a). SNL/CA includes provisions for cultural resources in all construction-related contracts where the potential for buried resources may be unearthed. In 2009, there were no buried archaeological resources unearthed at SNL/CA.

In 2001, SNL/CA completed an historic building survey. None of the buildings onsite are identified as historically significant or eligible for the National Register of Historic Places (SNL 2002). The results of the historic building survey were submitted to NNSA/SSO. In December 2004, NNSA transmitted the survey results to the California State Historic Preservation Officer (SHPO). In April 2005, NNSA/SSO received concurrence from the

California SHPO that none of the properties located at SNL/CA are eligible for inclusion in the National Register of Historic Places.

On September 22, 2004, DOE issued updated guidelines for developing cultural resource management plans (CRMP) for all DOE facilities (DOE 2004b). These guidelines are intended to assist each facility in meeting the statutory and regulatory requirements applicable to cultural resources. In 2005, SNL/CA prepared a site-specific CRMP following DOE guidance.

## **3.8 Environmental Restoration**

### **3.8.1 Comprehensive Environmental Response, Compensation, and Liability Act**

Between 1984 and 1986, DOE investigated the SNL/CA site under their Comprehensive Environmental Assessment and Response Program (CEARP) to identify and assess potential environmental problems (DOE 1986). The CEARP investigation evaluated compliance with major federal environmental laws, including the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 USC § 9601). CERCLA established liability compensation, cleanup, and emergency response for hazardous substances released to the environment. During the CEARP investigation, two potential CERCLA sites were identified at SNL/CA, the Fuel Oil Spill Site and the Navy Landfill. A Hazard Ranking System study was performed for each site to determine if either qualified for listing on the National Priorities List. Hazard Ranking System scores for both sites fell below 28.5, the qualifying score for listing. Since completion of the CEARP investigation, there have been no hazardous substance releases or contaminated sites found at SNL/CA that warranted CERCLA investigation or a Hazard Ranking System study.

In addition to cleanup and emergency response requirements, CERCLA also established a program to report spills of hazardous substances to the National Response Center. SNL/CA incorporates CERCLA reporting requirements into an operating procedure for spill prevention and control (SNL/CA 2008b). In 2009, there were no releases of hazardous substances that required notification under CERCLA.

### **3.8.2 Site Clean-up Orders**

Since 1985, environmental restoration and monitoring activities at SNL/CA have been conducted in compliance with site clean-up orders issued by the California Regional Water Quality Control Board, San Francisco Bay Region under provisions established in the California Water Code (California RWQCB 1989). Although there are no active remediation sites at SNL/CA, groundwater monitoring is ongoing at two locations, the Fuel Oil Spill site and the Navy Landfill. SNL/CA currently samples three groundwater monitoring wells for residual contamination, two at the Fuel Oil Spill site (when there is sufficient water to collect a sample), and one at the Navy Landfill. Sampling results are presented in Chapter 5, Environmental Monitoring.

## 3.9 Hazardous Materials

### 3.9.1 Emergency Planning and Community Right-to-Know Act

The Emergency Planning and Community Right-to-Know Act (EPCRA) -- also known as the Superfund Amendments and Reauthorization Act of 1986, Title III (SARA Title III) (42 USC §11001, et. seq.) -- requires reporting of toxic chemical usage and releases. To meet EPCRA requirements, SNL/CA submits annual reports to the EPA, the State of California Office of Emergency Services, Alameda County Department of Environmental Health, and the Alameda County Fire Department. EPCRA reporting requirements applicable to SNL/CA for 2009 are presented in Table 3-1.

**Table 3-1 Status of EPCRA Reporting at SNL/CA, 2009**

EPCRA Section	Description of Reporting	Required in 2009
Sec. 302-303	Planning Notification	Yes (sulfuric acid only)
Sec. 304	Extremely Hazardous Substances Release Notification	No
Sec. 311-312	Material Safety Data Sheet/ Chemical Inventory	Yes
Sec. 313	Toxic Release Inventory Reporting	Yes (lead only)

### 3.9.2 California Hazardous Materials Release Response Plans and Inventory Law

The California Hazardous Materials Release Response Plans and Inventory Law (Assembly Bill 2185) addresses the management of hazardous and acutely hazardous materials in the state. Additional requirements pertaining to hazardous materials are codified in the California Health and Safety Code, Division 20, Chapter 6.95 §25500, et seq. In compliance with California requirements, SNL/CA annually submits a Hazardous Material Business Plan to the Alameda County Department of Environmental Health.

### 3.9.3 Underground Storage Tanks

Hazardous or petroleum products stored in underground storage tanks (UST) are regulated under California Health and Safety Code Division 20, Chapter 6.7, §§ 25280-25299.8. California code incorporates the UST provisions of the Resource Conservation and Recovery Act (RCRA) and establishes standards for construction, operation, maintenance, inspection, and testing of USTs. The Alameda County Department of Environmental Health is the regulating authority for USTs at SNL/CA. SNL/CA operates one UST in accordance with California requirements. Each year, SNL/CA declares the tank through the Hazardous Material Business Plan described in Section 3.7.2, and receives a permit to operate from Alameda County.

### 3.9.4 Toxic Substances Control Act

The Toxic Substances Control Act (TSCA) is the primary Federal statute regulating the manufacture, use, distribution, disposal, import, or export of certain chemicals and

substances (15 USC § 2601 et. seq.). TSCA requirements that are applicable to Sandia operations are incorporated into Sandia's ES&H Corporate Process (SNL 2009c). For SNL/CA operations, the only TSCA regulated chemicals imported or exported are for research and development purposes thus exempt from general reporting requirements. However, SNL/CA notifies EPA of exempt imports and exports when appropriate. In 2009, SNL/CA did not prepare any TSCA Notification of Export declarations.

SNL/CA tracks disposal of TSCA materials that are not otherwise captured as RCRA or California toxic hazardous waste. These materials include asbestos and polychlorinated biphenyls (PCBs). The majority of TSCA waste generated onsite is asbestos from abatement activities. Only small quantities of PCB wastes are generated at SNL/CA, consisting of light ballasts that are not specifically marked as PCB-free.

### **3.9.5 Federal Insecticide, Fungicide, and Rodenticide Act**

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) restricts the registration, sale, use, and disposal of pesticides (includes herbicides, insecticides, fungicides, and rodenticides) (7 USC § 136). Activities at SNL/CA that fall under the provisions of FIFRA include the storage and use of pesticides, and disposal of pesticide containers. Pesticide handling and storage follows a site-specific standard operating procedure that includes provisions for training, use of personal protective equipment, proper handling following manufacturers guidelines, secondary containment during storage, and disposal of product and containers (SNL/CA 2009b). Pesticide use at SNL/CA is overseen by a certified pesticide applicator.

## **3.10 Pollution Prevention and Waste Minimization**

Pollution prevention concepts first appeared in RCRA. An expressed concern was to minimize the generation of hazardous waste through process substitution, materials recovery, recycling, reuse, and treatment. RCRA established the reduction or elimination of hazardous waste as national policy, and required that hazardous waste generators and RCRA permit holders have a program in place to minimize waste. SNL/CA is required to report waste generation and recycling information yearly to DOE. To meet this requirement, the Annual Waste Generation and Pollution Prevention Progress Report was submitted to DOE on December 1, 2009 (SNL/CA 2009e). Additionally, SNL/CA's Waste Minimization Certificate required by the Hazardous Waste Storage Facility Part B Permit was submitted to the California Department of Toxic Substances Control (DTSC) prior to the March deadline.

### **3.10.1 Pollution Prevention Requirements of DOE Order 450.1A**

DOE Order 450.1A establishes five performance-based sustainable environmental stewardship goals (see Section 3.1 for a list). During 2009, SNL/CA continued implementation of site-specific activities to support these goals including:

- increasing the use of bio-based products;
- increasing the percentage of computer desktops, monitors, and laptops purchased that meet EPEAT-registered silver and above;
- continuing management of batteries as universal waste.

As required by Order 450.1A, SNL/CA implements affirmative procurement programs that favor acquisition and use of environmentally preferable products and services. At SNL/CA, affirmative procurement is a coordinated effort between the Pollution Prevention and Waste Minimization (PP/WM) Program and the Procurement Department. The PP/WM staff communicates environmentally preferable purchasing requirements through presentations and training targeting individuals involved in purchasing products and services. Both groups work closely with suppliers to ensure that environmentally preferable products are available for purchase.

SNL/CA tracks improvements in environmentally preferable purchasing as part of the site environmental management system. In 2009, 97 percent of the EPA required affirmative procurement products purchased by SNL/CA met EPA standards for justified products and recycled content, compared to 89.4 percent in 2008 (see Section 4.2). SNL/CA submitted the Annual Environmental Preferable Purchasing Report (SNL/CA 2009d) to DOE on December 1, 2009 for use in DOE's annual report.

Additional information about pollution prevention activities is provided in Chapter 4.

### **3.10.2 Hazardous Waste Source Reduction and Management Review Act**

The California Hazardous Waste Source Reduction and Management Review Act of 1989, (Senate Bill 14), requires hazardous waste generators to consider source reduction as the preferred method of managing hazardous waste. Under this act, facilities that generate more than 12,000 kilograms (kg) of hazardous waste or 12 kg of extremely hazardous waste annually are required to conduct source reduction planning.

Under an agreement between DOE and DTSC, all of DOE's California sites are considered one waste generator, rather than individual DOE facilities. Every four years, SNL/CA completes a Source Reduction and Evaluation Review and Plan in cooperation with the three other DOE sites in California: Lawrence Livermore National Laboratory (LLNL); Lawrence Berkeley National Laboratory; and Stanford Linear Accelerator Center. The most recent plan was submitted to DTSC on August 30, 2007 and provided information for 2003 through 2006. The plan also identifies waste reduction opportunities for any waste stream that is over five percent of a site's total routine regulated waste. The next plan, which will include information from calendar year 2010, will be prepared in 2011.

### **3.10.3 Pollution Prevention Act**

The Pollution Prevention Act of 1990 declares, as national policy, that pollution should be prevented or reduced at the source (42 USC § 13101 et. seq.). Facilities that meet the reporting requirements under EPCRA, Section 313 are also required to file a toxic chemical source reduction and recycling report. The Section 313 report for 2009 (for lead only) will include source reduction and recycling information to meet this requirement. The report is due annually on July 1. See Section 3.9.1 for additional information on EPCRA reporting requirements.

## **3.11 Hazardous Waste**

### **3.11.1 Federal Facility Compliance Act**

The Federal Facility Compliance Act waives sovereign immunity with respect to RCRA for federal facilities (42 USC § 6961). The act gives EPA, and authorized states, authority to conduct annual inspections of federal facilities and establishes requirements for management of hazardous/mixed waste.

SNL/CA is not subject to a site-specific federal facility compliance agreement for mixed waste. The site does not possess or store any legacy mixed waste. All mixed waste generated at SNL/CA during 2009 was appropriately managed under the site's RCRA Hazardous Waste Facility Permit.

### **3.11.2 Resource Conservation and Recovery Act**

RCRA regulates the generation, transportation, treatment, storage, and disposal of hazardous chemical waste, non-hazardous solid waste, and hazardous or petroleum products stored in USTs (42 USC §6901 et. seq.). The State of California has authority from the EPA to implement RCRA. The DTSC administers most aspects of RCRA in the state, and is the regulating authority for hazardous waste operations at SNL/CA, including the hazardous component of radioactive mixed waste.

SNL/CA operates a Hazardous Waste Treatment and Storage Facility under a RCRA Hazardous Waste Facility Permit issued by DTSC on March 30, 2004. The permit is effective through March 2014 and allows for storage and treatment of hazardous waste.

By definition, SNL/CA is a large quantity generator of RCRA waste. As such, the site is required under RCRA standards and implementing regulations (40 CFR 262.41) to submit a biennial report to EPA on even numbered years.

### **3.11.3 California Hazardous Waste Control Law**

The Hazardous Waste Control Law (California Health and Safety Code §25100 et. seq.) provides a separate regulatory framework for hazardous waste management in California. The state law incorporates all RCRA requirements and imposes additional requirements that are broader and more comprehensive than the federal system. Under the California law, additional waste materials (e.g., oils, metals, asbestos) or activities (e.g., treatment) are regulated as hazardous. State standards are incorporated into SNL/CA's Waste Management Program so that California regulated waste is managed as hazardous waste in compliance with state requirements.

The California Environmental Health Standards for Management of Hazardous Waste (22 CCR, Division 4.5) require all permitted hazardous waste facilities to submit an annual facility report to DTSC. Annual facility reports provide information about the quantity of RCRA and California designated hazardous waste generated and stored at SNL/CA, and the quantity of waste shipped from the site.

SNL/CA submits an annual facility report to DTSC either in the form of the federal Biennial Report or the California Annual Facility Report, or both if requested by DTSC.

### **3.11.4 Medical Waste Management Act**

The California Medical Waste Management Act (California Health and Safety Code, Division 104, Part 14, §§ 117600-118360) provides for regulation of medical waste generators, transporters, and treatment facilities. The Alameda County Department of Environmental Health is the regulating authority for medical waste generated at SNL/CA. SNL/CA has two facilities identified as small quantity generators of medical waste, one with limited onsite treatment and one without onsite treatment.

## **3.12 Radiation Protection**

### **3.12.1 Atomic Energy Act**

The purpose of the Atomic Energy Act is to assure the proper management of nuclear materials and radioactive waste (42 USC § 2011 et. seq.). The act allows DOE to set radiation protection standards to control exposure to the public and the environment that may result from operations at DOE facilities. DOE sets these standards through department directives or orders. Operations at SNL/CA are subject to the requirements established in *DOE Order 435.1, Radioactive Waste Management* (DOE 2001) and *DOE Order 5400.5, Radiation Protection of the Public and the Environment* (DOE 1993).

### **3.12.2 DOE Order 435.1, Radioactive Waste Management**

DOE Order 435.1 establishes requirements to manage radioactive waste in a manner that protects the environment, and worker and public health and safety. Under this order, DOE contractor operated facilities are required to plan, document, execute, and evaluate the management of radioactive waste. Requirements of Order 435.1 are incorporated into the SNL/CA radioactive waste management element of the Waste Management Program. The program includes certification and characterization of waste; provisions for inspections and audits; training requirements; and operating procedures for handling, storing, packaging, shipping, and offsite disposal of radioactive waste.

SNL/CA generates low-level radioactive waste and low-level mixed waste. No transuranic or high-level radioactive waste is generated by SNL/CA operations. Low-level radioactive and mixed wastes are stored prior to shipment in the Radioactive Waste Treatment and Storage Facility. Low-level radioactive waste is shipped offsite to SNL/NM with final land disposal at the Nevada Test Site. Mixed Waste is managed under federal RCRA and state waste regulations and shipped offsite for treatment and disposal via commercial disposal facilities.



### 3.12.3 DOE Order 5400.5, Radiation Protection of the Public and the Environment

DOE Order 5400.5 sets radiation protection standards for DOE operations so that radiation exposures to members of the public and the environment are as low as reasonably achievable (ALARA) and maintained within established limits of the order. Table 3-2 provides a summary of SNL/CA compliance with this order in 2009.

**Table 3-2 Order 5400.5 Compliance Summary, 2009**

<b>Order 5400.5 Requirement</b>	<b>SNL/CA 2009 Summary</b>
Maximum exposure to members of public = 100 mrem/yr	There were no radionuclide emissions in 2009. The average annual gamma radiation measurement at the site perimeter in 2009 was 61.8 mrem or 5.6 mrem more than distant locations, where the average annual dose was 56.2 mrem. The difference between perimeter and distant locations is most likely the result of normal fluctuations and natural variations in ambient radiation.
Adopt ALARA exposures	ALARA is incorporated into the environment, safety, and health (ES&H) policy, ES&H manual, and site operating procedures.
Control release of liquid radioactive wastes to the environment	No intentional discharges of liquid wastes to the environment occur onsite. No accidental releases of liquid radioactive waste occurred in 2009.
Control burial of low-level waste	Disposal of low-level waste <u>does not</u> occur onsite. ES&H procedures, manuals, and management systems are incorporated into site operations to ensure proper handling, and disposal of radioactive materials offsite at approved facilities.
Control radioactive releases to the sanitary sewer	Radioactive releases to the sanitary sewer above DOE 5400.5 guidelines are not allowed at SNL/CA. ES&H procedures, manuals, and management systems are incorporated into site operations to ensure proper handling and disposal of radioactive materials.
Implement environmental monitoring and surveillance	An environmental monitoring and surveillance program has been in place at SNL/CA for more than 30 years.
Control the release of property with residual radioactivity	SNL/CA <u>does not</u> release any property to the public with residual radioactivity above authorized limits. Excess property of this type is either transferred to other DOE facilities for reuse or transferred to Waste Management for disposal.
NESHAPS Dose evaluations	There were no airborne radionuclide emission sources in 2009; therefore, there is no monitoring data available for dose evaluations.

### 3.13 Water Quality and Protection

SNL/CA is subject to the requirements of the Clean Water Act and equivalent California statutes. SNL/CA does not operate a public water system, and is not involved in any environmental restoration activities for which Safe Drinking Water Act standards are being applied.

Drinking water at SNL/CA is purchased through LLNL and obtained from the San Francisco Water District or the Alameda County Flood Control and Water Conservation District, Zone 7. The San Francisco Water District and Zone 7 are responsible for monitoring the quality of the incoming water. SNL/CA is not required to treat or sample the drinking water. LLNL maintains the primary drinking water distribution system that feeds to SNL/CA and screens for water quality (SNL/CA 2002).

#### 3.13.1 Clean Water Act

The Clean Water Act regulates all direct discharges into navigable waters of the United States (U.S.) (33 USC § 1251). Direct discharges to waters of the U.S. require permits issued under the National Pollutant Discharge Elimination System (NPDES). In California, the State Water Resources Control Board has authority from EPA to implement the Clean Water Act. Federal permitting requirements are included in Waste Discharge Requirements issued by Regional Water Quality Control Boards.

#### ***Wastewater Discharge***

Wastewater generated at SNL/CA is discharged to the City of Livermore Water Reclamation Plant, a publicly owned treatment works (POTW). The Livermore POTW maintains an NPDES permit, and then regulates industry discharges into their sewer system. A Wastewater Discharge Permit issued by the Livermore POTW regulates SNL/CA's wastewater discharges. The permit is updated annually and includes discharge limits for the site sanitary sewer outfall and for processes subject to EPA pretreatment standards. Permit exceedances that occurred in 2009 at the sanitary sewer outfall are presented in Table 3-3. See Section 3.13 for additional information regarding these exceedances.

**Table 3-3 Wastewater Discharge Permit Exceedances at Sanitary Sewer Outfall, 2009**

Parameter	No. of Samples Taken	No. of Compliant Samples	Percent Compliant	Date(s) of Exceedance	Description	Status / Resolution
Copper / Zinc	365	362	99%	Feb. 9 and 10, 2009; Sept. 8, 2009	Two exceedances for copper, lead, and zinc, one for copper only	Changes to sampling protocol being evaluated. Sources of copper being evaluated. (See Section 3.15 for more detail.)

SNL/CA has three categorical processes that are subject to EPA's pretreatment standards: two metal finishing operations, and a semiconductor manufacturing operation. The two metal finishing operations are closed-loop processes and do not discharge any effluents. Wastewater generated from the semiconductor manufacturing process is sampled and monitored as part of the Environmental Monitoring Program. There were no exceedances of the discharge limits from this source during 2009.

### ***Storm Water Discharge***

General storm water discharges at SNL/CA are covered under the *State of California NPDES General Permit for Storm Water Discharge Associated with Industrial Activities* (General Permit) (California Water Resources Control Board 1997). The General Permit requires SNL/CA to implement a storm water pollution prevention plan. The SNL/CA plan describes the rationale for monitoring discharge locations and identifies best management practices for reducing pollutant contact with storm water.

SNL/CA's storm water management program also incorporates the six minimum control measures required by the California Small Municipal Separate Storm Sewer System (MS4) General Permit. The MS4 General Permit was adopted in 2003 to meet EPA Phase II storm water regulations. Although the MS4 General Permit is not yet a regulatory requirement for SNL/CA, the site anticipates that it will be regulated as a non-traditional small MS4 when notification is provided by the regulating agency. The Small MS4 General Permit will require full implementation of a Storm Water Management Program (SWMP), addressing the six minimum control measures, within five years of notification / designation as a non-traditional Small MS4. In addition to proactively incorporating the minimum control measures into the existing storm water management program, SNL/CA completed a five-year implementation schedule in 2008.

In 2009, SNL/CA visually monitored 21 storm water discharge locations and sampled nine locations. The result of monitoring and sampling activities conducted in 2009 did not identify any issues of concern. Section 5.1 presents a summary of 2009 results.

## **3.14 Audits, Assessments, and Inspections**

Table 3-4 provides a list of environmental program audits, assessments, and/or inspections conducted at SNL/CA during 2009.

**Table 3-4 SNL/CA Audits, Assessments, and Inspections, 2009**

<b>Title</b>	<b>Area of Focus</b>	<b>Date Conducted</b>	<b>Results</b>
Alameda County Inspection	Erosion at the Navy Landfill site	March 23, 2009	No violations
City of Livermore, Water Resources Division Inspections	Wastewater discharges and categorical process laboratories	October 19, 2009	No violations
Third Party Environmental Management System (EMS) Recertification Audit (NSF-ISR)	Conformance with the ISO 14001:2004 EMS standard	June 8-11, 2009	ISO recertification obtained for 3 additional years
Alameda County Inspection	Underground Storage Tanks	March 9, 2009	No violations
U.S. Environmental Protection Agency	Waste management	May 21, 2009	One minor finding - corrected on the spot
DOE/ SSO Packaging and Transportation Audit	Hazardous waste packaging and transportation	September 15 – 17, 2009	One finding related to documentation – corrected Nov. 2009

### 3.15 Environmental Occurrences

SNL/CA had two environmental occurrences in 2009 for exceedances at the sanitary sewer outfall. The first occurrence resulted from discharge of an estimated 3000 gallons of non-hazardous sludge / slurry into a manhole by a subcontractor on February 9, 2009. The sludge/slurry was comprised of filtered sediment loosened during cleaning and repair of the site sewer lines and approximately 650 gallons of effluent collected by the subcontractor at an off-site car wash facility prior to arriving at Sandia. In daily samples collected on February 9 and 10, copper concentrations were 15.0 and 7.4 mg/L, zinc concentrations were 21.0 and 7.2 mg/L, and lead concentrations were 0.89 and 0.37 mg/L, respectively. The discharge limit for copper is 1.0 mg/L, for zinc it is 3.0 mg/L, and for lead it is 0.2 mg/L. Administrative controls were implemented as a result of this occurrence that require all tank trucks to be empty upon arrival to the site. In addition, several critical sewer manhole covers have been locked and access controls have been implemented.

The second occurrence for an exceedance at the sanitary sewer outfall occurred on September 8, 2009. A copper concentration of 1.1 mg/L was found in the daily sample. Although the source could not be identified, Sandia's management team developed and adopted an action plan that is investigative in nature moving SNL/CA towards a greater understanding of the continuing issue while trying to discover the source of high metals.

### 3.16 Permits

Environmental permits and clean-up orders held by SNL/CA are listed in Table 3-5. Additional information is provided in previous sections under the related program or regulation.

**Table 3-5 SNL/CA Environmental Permits and Orders, 2009**

Type	Description	Effective Date	Statute / Regulation	Issuing Agency
Environmental restoration	Site Clean-up Order No. 89-184	December 1989 (no expiration date)	California Water Code	Regional Water Quality Control Board, San Francisco Bay
Hazardous materials	Business Plan Permit to Operate	November 1, 2009 - October 31, 2010	California Health and Safety Code	Alameda County Environmental Health Department
Hazardous waste	RCRA Hazardous Waste Facility Permit	March 2004 - March 2014	Resource Conservation and Recovery Act	California Department of Toxic Substances Control
Hazardous waste	Permit by Rule	November 1, 2009 - October 31, 2010	California Health and Safety Code	Alameda County Environmental Health Department
Hazardous waste	Conditionally Authorized Permit to Operate	November 1, 2009 - October 31, 2010	California Health and Safety Code	Alameda County Environmental Health Department
Medical waste	Small Quantity Generator with Onsite Treatment	August 9, 2009 - August 8, 2010	California Health and Safety Code	Alameda County Environmental Health Department
Medical waste	Small Quantity Generator without Onsite Treatment	April 11, 2009 - April 10, 2010	California Health and Safety Code	Alameda County Environmental Health Department
Wastewater	Wastewater Discharge Permit	August 4, 2009 - August 3, 2010	Clean Water Act	City of Livermore Water Reclamation Plant
Storm water	State of California General Industrial Permit	July 1997 - July 2002 <sup>a</sup>	Clean Water Act	California Water Resources Control Board
Jurisdictional waters of the U.S.	Channel Improvements under the Arroyo Seco Improvement Program	September 25, 2008 – July 11, 2018	Clean Water Act	Army Corp of Engineers
Underground storage tank	Permit to Operate	November 1, 2009 - October 31, 2010	Resource Conservation and Recovery Act and California Health and Safety Code	Alameda County Environmental Health Department
Aboveground storage tanks	Storage statement	July 1, 2009 - June 30, 2010	Aboveground Petroleum Storage Act	Alameda County Environmental Health Department

<b>Type</b>	<b>Description</b>	<b>Effective Date</b>	<b>Statute / Regulation</b>	<b>Issuing Agency</b>
Air	Permit to Operate 13 emission sources: 1 non-retail gasoline dispensing facility; 5 miscellaneous (decontamination sink, waste compactor, drum crusher, two site wide sources for solvent emissions); 6 emergency generators; 1 portable generator with discretionary usage	July 1, 2009 - June 30, 2010	Clean Air Act	Bay Area Air Quality Management District
Universal waste	Generator statement	February 1, 2006	California Electronic Waste Recycling Act	California Department of Toxic Substances Control

<sup>a</sup> The current General Permit continues in effect until a new permit is issued by the State Water Resources Control Board (Permit Section C.18). When the renewal process is complete and a new General Permit issued by the State, SNL/CA will apply for coverage under the new permit.

## 4 Environmental Management

Sandia National Laboratories, California (SNL/CA) is firmly committed to sound environmental stewardship practices as well as compliance with environmental requirements. SNL/CA meets this commitment through an environmental management system (EMS) that integrates traditional environmental program elements with objectives for improving the environmental footprint of site operations. The site's EMS program is dynamic, encompassing an annual cycle of planning, implementing, assessing, and improving operations in support of site-specific environmental goals.

SNL/CA's EMS program conforms to the international standard for environmental management systems, ISO 14001. SNL/CA initially received ISO 14001:2004 registration on September 25, 2006. In June 2009, the site underwent a successful audit to the ISO 14001 standard and received re-registration for an additional 3-year period on July 5, 2009. To ensure that the site maintains conformance with the standard, surveillance audits are conducted periodically. The next surveillance audit of the SNL/CA EMS program will take place during the summer of 2010.

### SNL/CA Environment, Safety, and Health (ES&H) Standard of Performance

SNL/CA is firmly committed to meeting all corporate and regulatory ES&H policies and requirements that apply to its operations. The application of compliant ES&H principles and practices is considered a fundamental element of everyone's work assignment.

In this regard, SNL/CA commits to:

- **Nurture a safety and health conscious work ethic and culture.** We will all assume responsibility for creating and maintaining a worksite, as well as performing our work, in a manner that respects and supports the safety and health of every individual. SNL/CA believes that all accidents are preventable. We will all strive to create a workplace that is free of accidents and injuries.
- **Be a responsible steward of the environmental resources in our care.** We will integrate environmental risk assessment, planning and impact mitigation into every aspect of our work. SNL/CA programs, operations, processes, and facilities will be planned and managed such that they support environmental objectives and targets to minimize the creation of waste, pollution, and adverse impact on the public and the environment. SNL/CA will remain committed to an efficient and effective Environmental Management System as part of the laboratory's Integrated Safety Management System.
- **Comply with all applicable laws, regulations and permits.** Compliance with the letter and the spirit of ES&H laws and regulations is viewed as the minimum acceptable standard. When necessary and appropriate we will go beyond legal mandates in order to implement more effective approaches and to nurture a positive and learning ES&H culture. SNL/CA is committed to continual improvement in all aspects of our environment, safety, and health performance and commits to establish performance indicators to guide these efforts and measure our progress.

### 4.1 EMS Elements

SNL/CA's EMS Program encompasses the seventeen elements of an effective EMS as identified in the ISO 14001:2004 standard. These elements are consistent with *DOE Order 450.1A Environmental Protection Program*, updated in June 2008, that requires DOE facilities to follow the ISO framework. Table 4-1 identifies the EMS elements and summarizes the methods, tools, and programs implemented in support of each.

**Table 4-1 Elements of the SNL/CA EMS Program**

<b>EMS Element</b>	<b>Implementation Summary</b>
Environmental policy	SNL/CA operates under a site-specific ES&H standard of performance that reinforces individual accountability, environmental stewardship, and compliance. SNL/CA stresses the need to move beyond compliance to nurturing of a positive ES&H culture at all levels of the workforce.
Environmental aspects	Environmental aspects are elements of operations and activities that can interact with the environment, such as water discharges. SNL/CA evaluates site activities and operations annually to ensure environmental aspects are up-to-date and accurate. From this complete list (19 aspects), significant aspects are determined through a risk evaluation. For 2009, SNL/CA's significant environmental aspects are water discharges, air emissions, land use, general transportation, and hazardous waste.
Legal and other requirements	Sandia maintains a formal process for monitoring federal, state, and local government publications for regulatory changes and issues applicable to Sandia operations. SNL/CA augments this process by monitoring publications specific to functional environmental program areas and through interaction with regulating agencies. Environmental subject matter experts analyze all new requirements, and team with other site personnel to achieve compliance. New requirements and modifications to environmental programs are documented in annual program reports.
Objectives and targets	<p>SNL/CA's EMS objectives support efforts to reduce potential environmental risk and enhance environmental stewardship. Broad objectives were established for all environmental aspects. The inclusion of objectives for all aspects is a best business practice that provides an expectation of overall environmental stewardship across the spectrum of activities conducted on site. SNL/CA evaluates and sets annual targets to support site objectives. At a minimum, targets are set for significant aspects and actions are identified to meet these targets. SNL/CA's objectives are to:</p> <ul style="list-style-type: none"> <li>➤ Provide exceptional environmental management for the site.</li> <li>➤ Minimize the volume and contamination of sewer water.</li> <li>➤ Minimize the volume and pollution of storm water runoff.</li> <li>➤ Minimize air emissions related to operations and transportation with particular emphasis on Spare-the-Air days.</li> <li>➤ Procure and use environmentally friendly products and materials.</li> <li>➤ Enhance the natural habitat.</li> <li>➤ Design and manage all buildings and facilities using "green" principles.</li> <li>➤ Minimize the environmental impacts of transportation.</li> <li>➤ Minimize the use of hazardous materials.</li> <li>➤ Minimize the use of radiological materials.</li> <li>➤ Minimize the generation of radioactive and mixed waste.</li> <li>➤ Minimize the use of biological materials.</li> <li>➤ Minimize the environmental impacts of site contaminated areas.</li> <li>➤ Minimize the generation of hazardous waste.</li> <li>➤ Establish an effective and efficient process for management of universal waste.</li> <li>➤ Reduce site legacy asbestos material.</li> <li>➤ Minimize the quantity of landfill waste through reduced consumption and/or reuse/recycling.</li> <li>➤ Minimize the potential environmental effects of hazardous material due to transportation.</li> <li>➤ Maximize the use of commute alternatives by members of the workforce.</li> <li>➤ Minimize site natural gas consumption.</li> <li>➤ Minimize site water consumption.</li> <li>➤ Minimize site electrical consumption.</li> <li>➤ Minimize the environmental effects of a site fire emergency.</li> <li>➤ Minimize the environmental effects of a site seismic event.</li> </ul>



EMS Element	Implementation Summary
Environmental programs	SNL/CA's EMS Program is supported by six functional environmental programs. Air Quality Environmental Monitoring Environmental Planning and Ecology Hazardous Materials Management Pollution Prevention and Waste Minimization Waste Management
Structure, responsibilities, and authorities	SNL/CA's EMS Program is implemented through existing site management and organizational structures. The site Vice President holds overall responsibility for success of the EMS Program. Director and senior management personnel ensure availability of resources. An environmental management representative and EMS core team are responsible for day-to-day management of the program. All members of the workforce hold responsibility and authority to implement EMS elements into their operations.
Competence, training, and awareness	SNL/CA employs a variety of mechanisms to ensure that the site workforce and visitors maintain the appropriate training and competence levels for their assignments, and to foster awareness. These mechanisms include corporate training programs, site-specific training programs, and activity-specific training programs. For contractor-directed activities that occur on site, SNL/CA issues standard specifications that identify training, credentials, and certifications required for each project.
Communication	SNL/CA communicates EMS information internally through project review teams, publications, websites, briefings, assessments, and promotional information. Information is communicated externally through publications, websites, SNL/CA's Public and Media Relations Office, and regulatory-driven documents.
EMS documentation	SNL/CA maintains an EMS Program Manual as the primary EMS document for the site. General corporate and site policies, document systems, and databases provide supporting documentation for the EMS Program.
Document control	At SNL/CA, document control is accomplished with electronic documents that are available in online databases. If paper copies of technical work documents are maintained at the point of use, department managers ensure that a process is in place to keep them up to date. Permits and other regulatory documents of external origin are typically marked as valid for a specified period and controlled by limited distribution coordinated by environmental program leads.
Operational controls	Sandia employs an integrated system to address ES&H concerns associated with site operations. This integrated system provides the framework for planning work, evaluating hazards, identifying controls, conducting work, and improving work processes. Unique to SNL/CA, the ES&H, Facilities, and Security Interdisciplinary Team supports integrated safety and environmental management to ensure requirements and controls are identified during project planning. Typical operational controls used at SNL/CA include technical work documents, environmental permits and compliance documents, contract specifications, and a variety of engineered controls.
Emergency preparedness and response	An established Emergency Management Program that maintains responsibility for preparedness and response supports SNL/CA's EMS Program. Emergency Management conducts routine drills and communication tests, and annually conducts site-wide training exercises. Environmental representatives are active members of emergency response teams to ensure that potential environmental risks are managed and mitigated appropriately.
Monitoring and measurement	Each of the six SNL/CA functional environmental programs monitors and measures the key characteristics of site operations that can affect the environment. Data collected supports compliance requirements as well as assessment of the site's overall progress in meeting EMS objectives. Monitoring data and metrics are available to the public in annual environmental reports.
Evaluating compliance	SNL/CA evaluates compliance with all environmental requirements through the Interdisciplinary Team process, self-assessments, and audits.

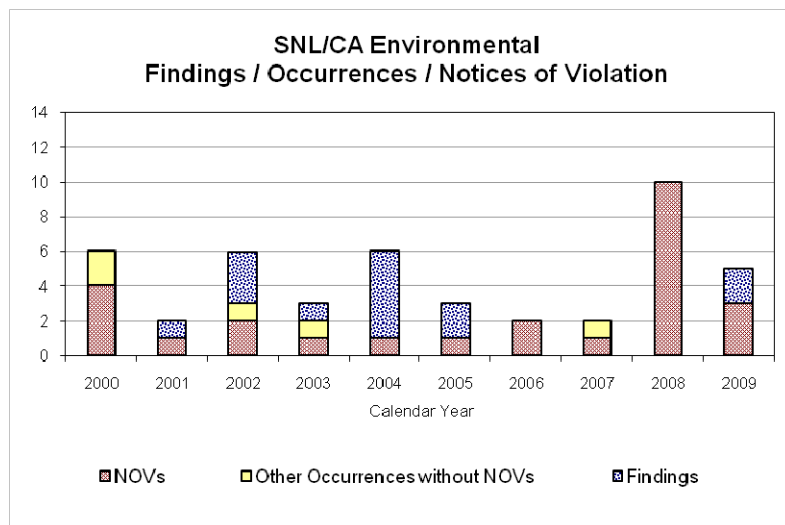
EMS Element	Implementation Summary
Nonconformity, corrective, and preventive action	SNL/CA documents, tracks, and verifies corrective and preventive actions with electronic assessment tracking and corrective action systems. The EMS Core Team also established a procedure for validating the effectiveness of select actions and to reduce the potential for recurrence of significant nonconformities.
Records	All information created by Sandia operations is managed as a record. ES&H information created at SNL/CA is managed by the site ES&H Records Center.
Management review	SNL/CA's top management team (VP and directors) review the EMS Program semi-annually. In 2009, management reviews resulted in six actions/recommendations related to hazardous material handling, new regulations, environmental impact reviews, management review, onsite vehicle use, and communications.

## 4.2 Environmental Performance

SNL/CA measures the site's environmental performance by tracking progress towards achieving EMS objectives and corporate performance measures established jointly between Sandia and the National Nuclear Security Administration, Sandia Site Office (NNSA/SSO). Data is available to measure many EMS objectives, but not all. In 2009, the site measured performance towards achieving 14 of the 24 established objectives. One corporate performance measure was also applicable to SNL/CA activities. The following diagrams and text summarize the site's progress and improvement in the last year. Table 4-1 provides the complete list of EMS objectives.

### ***Program Management Objective: Provide exceptional environmental management for the site***

**Figure 4-1 Measurement of Excellence in Environmental Management**



SNL/CA tracks noncompliance with environmental requirements as a measure of our environmental management performance. This objective also supports a 2009 NNSA/SSO performance measure for effective implementation of an integrated safety management system to ensure safety as well as protection of the environment. This NNSA/SSO performance

measure includes a target for no issued notices of violation and ensuring environmental regulatory compliance. Figure 4-1 shows the number of findings from third-party audits (includes DOE), notices of violation<sup>4</sup>, and other environmental occurrences since 2000. The

<sup>4</sup> The two occurrences noted in Section 3-15 resulted in notices of violation and are captured under the NOV category in Figure 4-1.

site goal is zero findings and zero violations. SNL/CA received three violations and two findings in 2009. As a routine element of the EMS Program, Sandia identifies and implements corrective and preventive actions in an effort to improve environmental performance and reach the site goal of zero violations and zero findings.

Registration and recognition of SNL/CA's EMS program provide other indicators of excellence in environmental management. SNL/CA became the first Sandia division to obtain ISO 14001:2004 registration for its EMS. By conforming to the ISO standard, SNL/CA integrates sound environmental stewardship practices with regulatory compliance to reduce the site's environmental footprint.



### ***Water Discharge Objective: Minimize the volume and contamination of sewer water***

SNL/CA continuously monitors wastewater generated on site. Figures 4-2 and 4-3 show the trend in weekly monitoring results since 2000 for copper and zinc, respectively. As shown, the site has experienced a gradual upward trend in levels of copper at the sewer outfall. The levels of zinc show a slight downward trend. Efforts that support improvement in sewer water quality are described in Chapter 5, Environmental Monitoring. Also reflected on the graphs are SNL/CA's goals of maintaining the level of copper and zinc below the regulatory analysis trigger level (0.5 mg/L for copper and 1.5 mg/L for zinc).

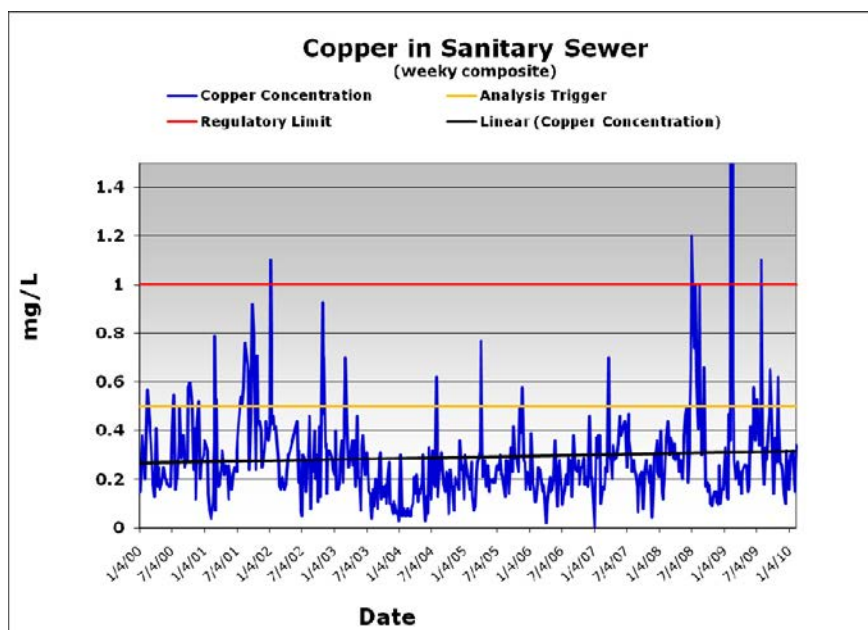


Figure 4-2 Weekly Composite Copper Concentrations in Wastewater

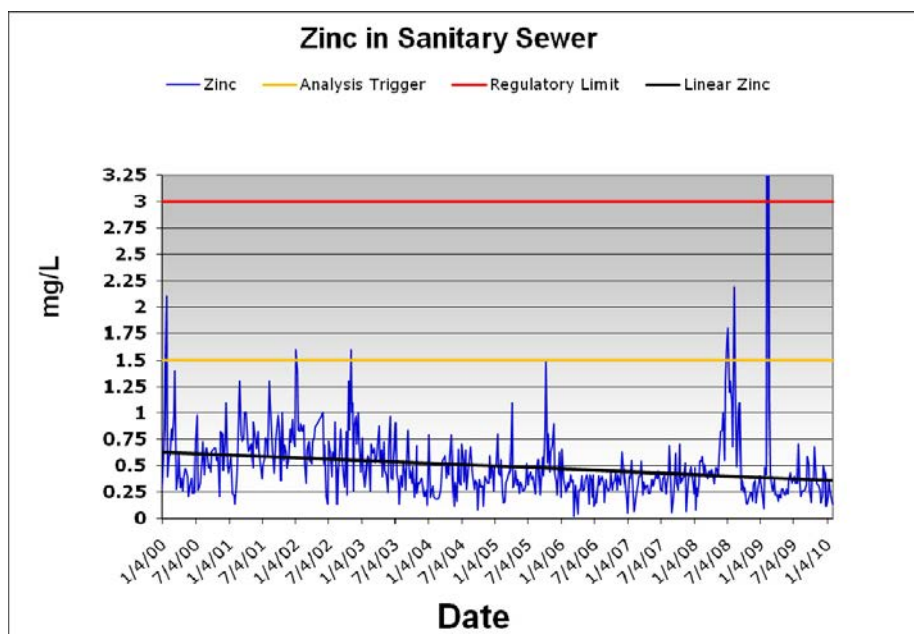
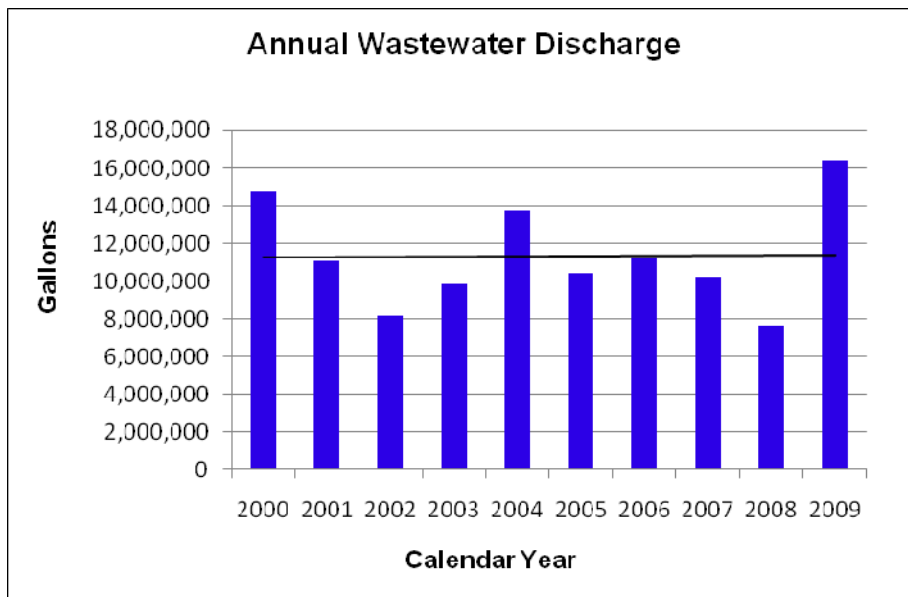


Figure 4-3 Weekly Composite Zinc Concentrations in Wastewater

Figure 4-4 shows volume of sewer effluent discharged by SNL/CA from 2000 through 2009. Sewer discharge in 2009 was 16.4 million gallons, approximately 8.8 million gallons more than in 2008<sup>5</sup>. SNL/CA has a stated goal of reducing the quantity of sewer effluent, although no numeric targets have been set. As shown on Figure 4-4, there is a slight upward trend in

<sup>5</sup> In 2008, SNL/CA experienced an unexplained low-flow of sewer effluent from the site, which is reflected in Figure 4-4.

wastewater discharges since 2000. Investigations into improving the flow monitoring at the sewer outfall are underway.



**Figure 4-4 Annual Wastewater Discharges**

***Water Discharge Objective: Minimize the volume and pollution of storm water runoff***

The State of California has not yet implemented numeric limits for pollutants in storm water. However, parameters such as total suspended solids (TSS) and oil and grease (O&G) are indicative of the quality of storm water runoff from SNL/CA parking lots and roads. Many factors can affect the quantities of TSS and O&G in the runoff, such as the length of dry weather before sample collection, volume of runoff during the storm, etc. SNL/CA's target for storm water is to clean debris from the entire storm water drainage system at least once per year to support minimizing pollution in the runoff. This goal has been achieved every year since implementation. In addition, SNL/CA implements street sweeping as another best management practice, which also minimizes storm water pollutants. In 2009, Sandia collected approximately 59 cubic yards of debris during street cleaning efforts, thus removing potential storm water pollutants. Figure 4-5 shows the highest TSS and O&G concentrations obtained at SNL/CA storm water sampling locations during the 2008/2009 rainy season. The highest concentration of TSS in storm water during 2008/2009 (108 mg/L) was higher than that obtained during the 2007/2008 rainy season (44 mg/L). The concentration of O&G in 2008/2009 was below the detection limit of 5 mg/L for all samples.

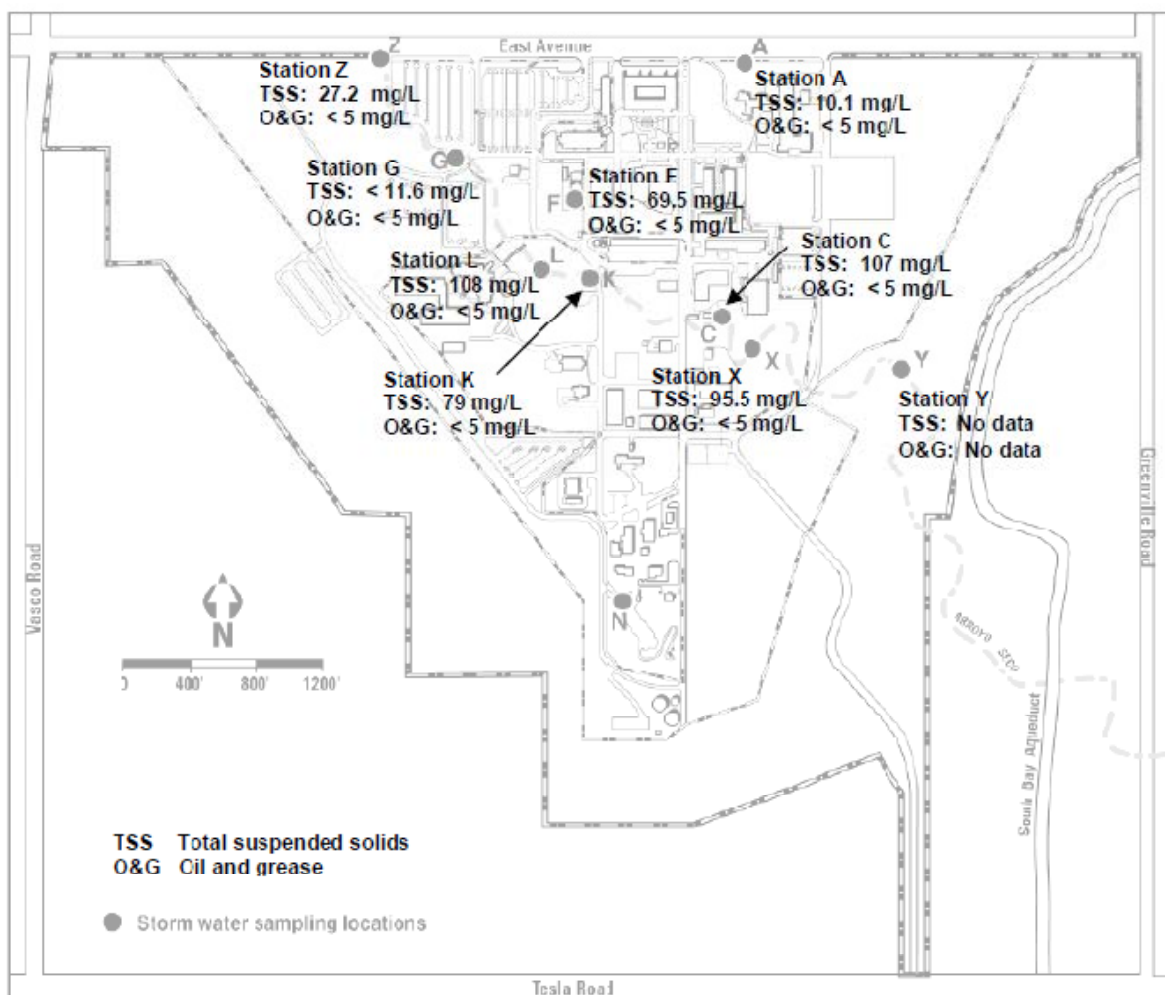


Figure 4-5 Constituents in Storm Water, 2008/2009 Rainy Season

***Air Emissions Objective: Minimize air emissions related to operations and transportation with emphasis on Spare-the-Air (STA) days***

During the summer of 2009, the Bay Area experienced fewer periods of unhealthy air quality, with the Bay Area Air Quality Management District (BAAQMD) issuing eight weekday STA advisories, compared to the 2008 STA season when thirteen weekday advisories were issued. Advisories notify the public when air pollution is expected to reach unhealthy concentrations and to encourage Bay Area residents to take individual action to reduce harmful pollutants. In 2008, the Air Quality Program established an EMS target to maintain on-site fueling operations on STA days at an average of less than or equal to three fill-ups per STA day. A program was developed and implemented that encourages site personnel to plan their gasoline fueling activities for either before or after a STA day. During the 2009 STA days, there were twenty-two fill-ups at the site. This averages to about 2.75 fill-ups per STA day, compared to an average of seven on a typical workday. Figure 4-6 shows the number of fill-ups on STA days over the last seven years.

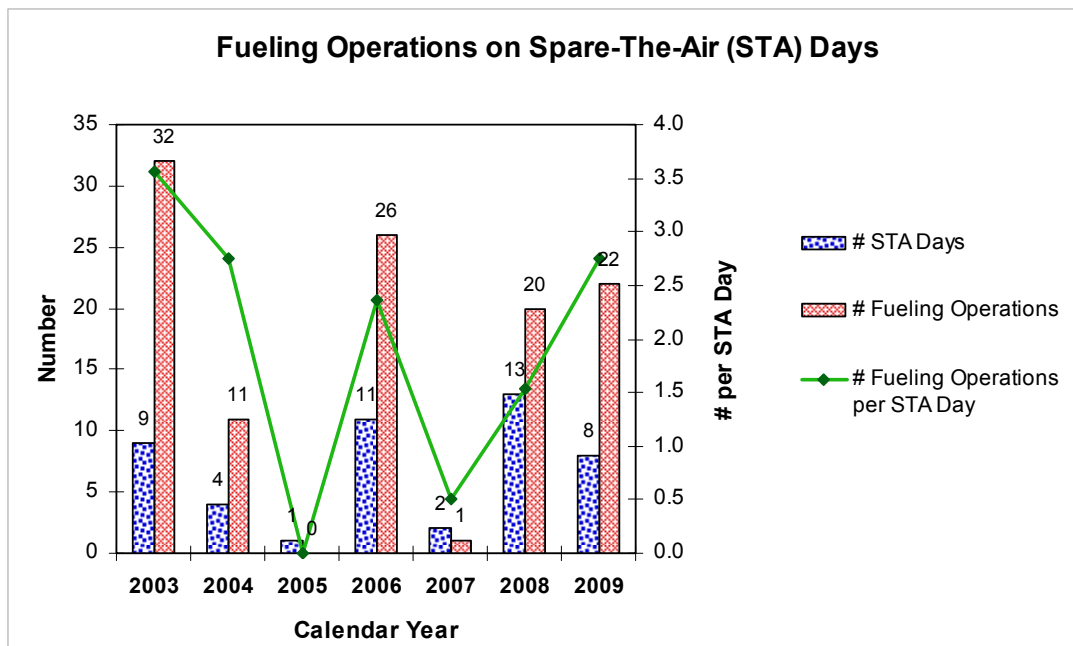


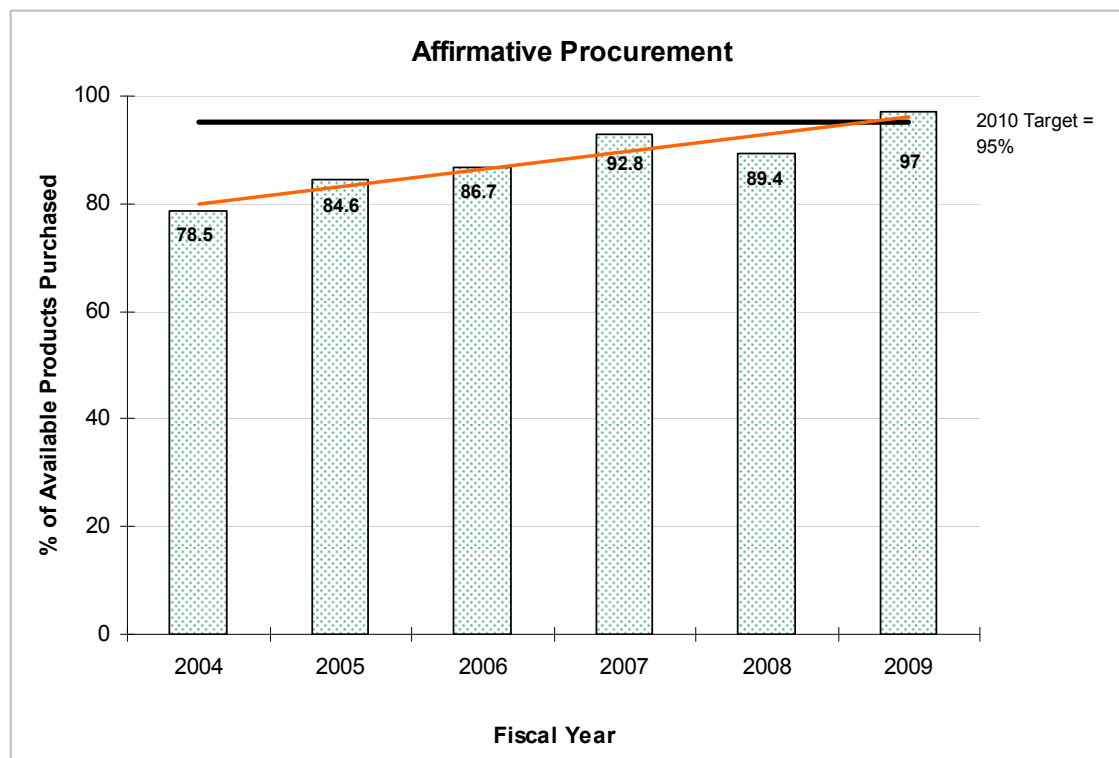
Figure 4-6 Number of Vehicle Fill-ups on STA Days<sup>6</sup>

***Material Procurement and Use Objective: Procure and use environmentally friendly products and materials (supports DOE sustainable environmental stewardship goals)***

In October 2009, SNL/CA established a new goal for material procurement that by fiscal year 2010, purchases made by the Affirmative Procurement Program will equal or exceed 95 percent of available procurements. The previous target of 96 percent was changed to be consistent with the new requirements of Executive Order 13514. SNL/CA achieved 97 percent in 2009, exceeding the established target. Figure 4-7 presents affirmative procurement data for the last six years. As shown, the site trend shows a steady increase in purchases that meet affirmative procurement criteria since 2004.

<sup>6</sup> In June 2006, the Bay Area experienced consecutive spare-the-air days, covering three consecutive workdays at SNL/CA. Site personnel deferred all fueling operations on the first two days, but were unable to sustain the delay on the third day, resulting in 17 fill-ups on June 26, 2006.





**Figure 4-7 Procurement of Environmentally Friendly Products**

***Land Use Objective: Enhance the natural habitat***

In June 2006, SNL/CA initiated an Arroyo Seco Improvement Program to address erosion and storm water control within the arroyo. The improvement program includes restoration of riparian habitat at select locations along the arroyo. SNL/CA restored approximately 0.05 acres of riparian habitat in 2006 and 2.49 acres in 2009 by planting a variety of native trees and reseeding disturbed areas with native grasses. The goal for plant survival at all areas is 85 percent. For areas planted in 2006, the survival rate is less than five percent currently. The poor survival rate is attributed to the lack of a functioning irrigation system in the restored areas. In 2009, SNL/CA completed repairs and/or restoration at nine additional locations along the arroyo. Two areas previously planted were also replanted in 2009. Irrigation systems were installed at each restored site to support plant growth and survival. Restored areas are evaluated annually in late summer, early fall to determine plant survival rates.

***Hazardous Materials Objective: Minimize the use of hazardous materials (supports DOE sustainable environmental stewardship goals)***

The overall goal of SNL/CA's EMS Program is protection of the environment from the negative effects of site activities including hazardous materials use. Central to this defense of the environment, is proper hazardous material inventory management. Right-sizing the inventory and minimizing toxicity is, therefore, key to environmentally friendly hazardous materials management. As shown in Figure 4-8 the number of hazardous material containers peaked in 2003 and have been steadily declining since. Overall, the number of containers for higher toxicity materials (shown as NFPA Health 3&4) has also declined since 2003,



although a small increase (29 containers) occurred in 2009. Declines experienced since 2003 reduce the risk inherent to personnel and the environment from hazardous materials used and stored on site. In 2009, SNL/CA did not establish a specific target for reduction of hazardous materials. Declines in 2009 were a result of routine chemical management at the site.

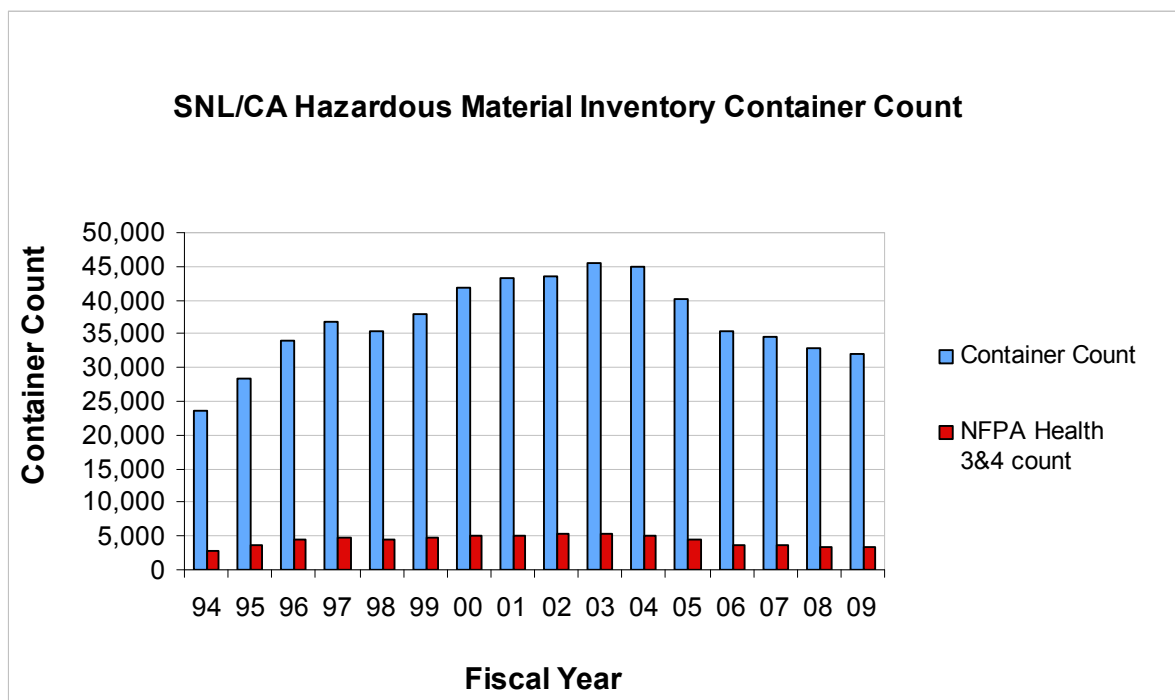


Figure 4-8 SNL/CA Hazardous Material Inventory

***Radioactive and Hazardous Waste Objectives: Minimize the generation of radioactive and hazardous waste (supports DOE sustainable environmental stewardship goals)***

Although SNL/CA does not have a specific target for this objective, we strive to minimize generation of radioactive and hazardous waste through process controls, recycling, and reapplication of chemicals from one activity to another. Figures 4-9 and 4-10 show hazardous and radioactive waste generated since 2000, respectively. For both categories of waste, the trend shows a steady decline in quantities generated. However, there was an increase in hazardous waste generated in 2009 compared to 2008. The increase was due to several events: a site cleanout that targeted chemicals over a specified age; cleanup and closure of the wastewater treatment facility that was taken out of service in 2006 for the Circuit Board Prototyping Lab; and several asbestos abatement projects.

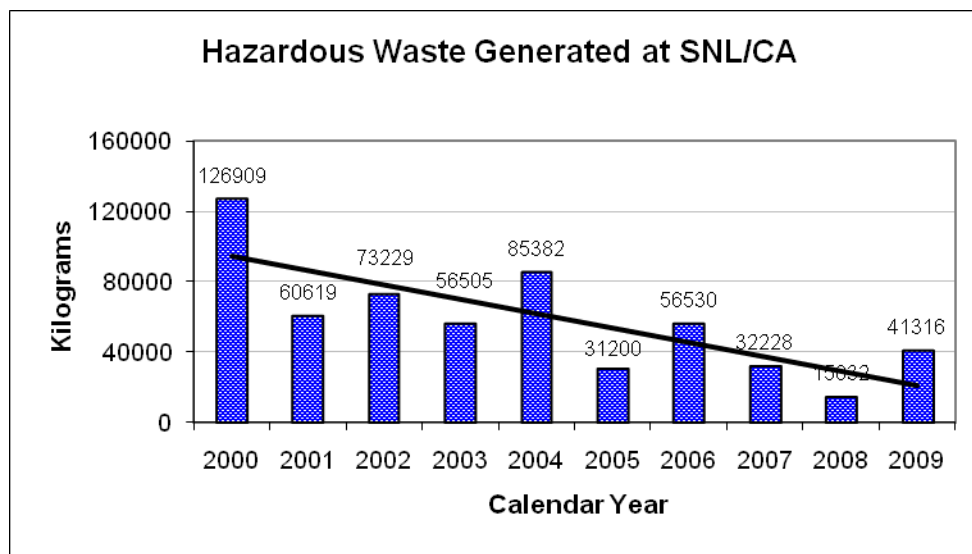


Figure 4-9 Hazardous Waste Generated at SNL/CA

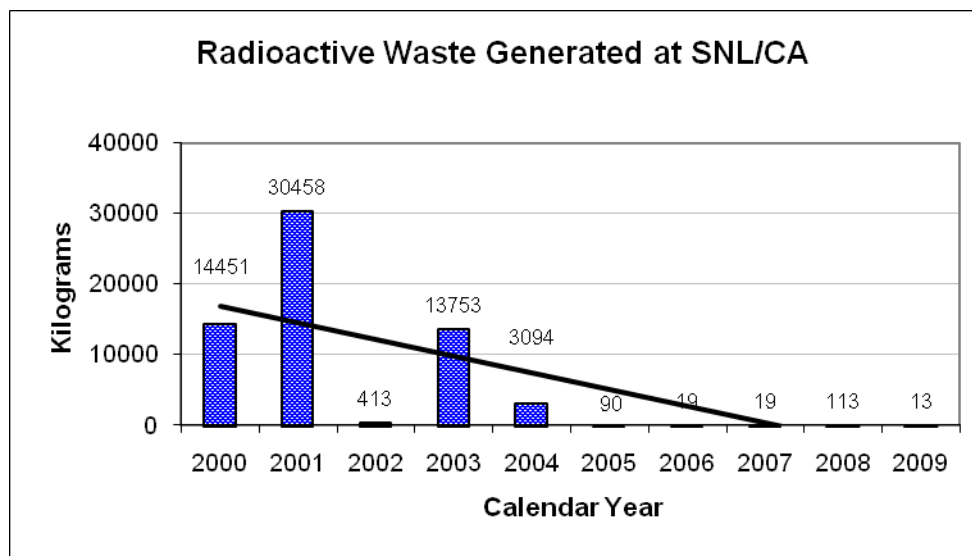


Figure 4-10 Radioactive Waste Generated at SNL/CA

**Asbestos Objective: Reduce site legacy asbestos material**

SNL/CA reduces site legacy asbestos material through routine abatement completed along with facility modification projects. In 2009, Sandia completed three asbestos abatement activities generating 19,208 kilograms of asbestos waste. Asbestos waste is a component of total hazardous waste presented in Figure 4-9.

**Solid Waste Objective: Minimize the quantity of landfill waste through reduced consumption and/or reuse/recycling (supports DOE sustainable environmental stewardship goals)**

SNL/CA transports non-hazardous solid waste (trash and construction debris) generated from site operations to local landfills for disposal. In fiscal year 2009, SNL/CA transported 99

metric tons of solid waste to landfills, a decrease of 7 metric tons from 2008. SNL/CA attributes this reduction to our continued recycling and reuse efforts. Figure 4-11 presents solid waste data for fiscal years 2003 to 2009.

Recycling data for the primary waste streams are presented in figures 4-12 through 4-14. The quantity of recycled material fluctuates from year to year depending on site activity. SNL/CA saw an increase in recycling of scrap metal and batteries during 2009. This is attributed to continuing efforts in collecting batteries for universal waste disposal and scrap metal for recycling. SNL/CA also saw an increase in the recycling of concrete during 2009. This is attributed to improvements in the Arroyo Seco as well as the demolition of a building and associated landscaping.

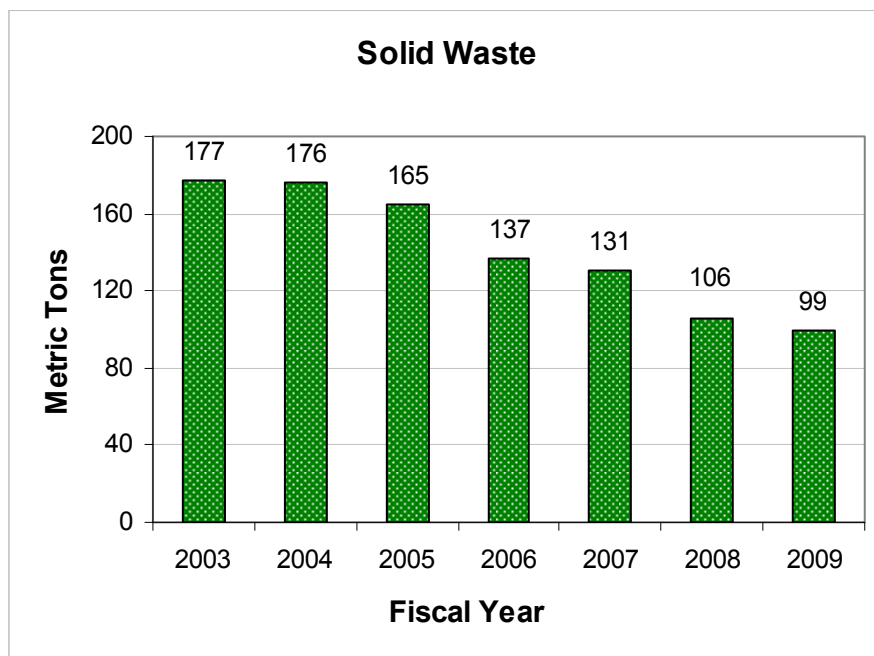


Figure 4-11 SNL/CA Landfill Waste

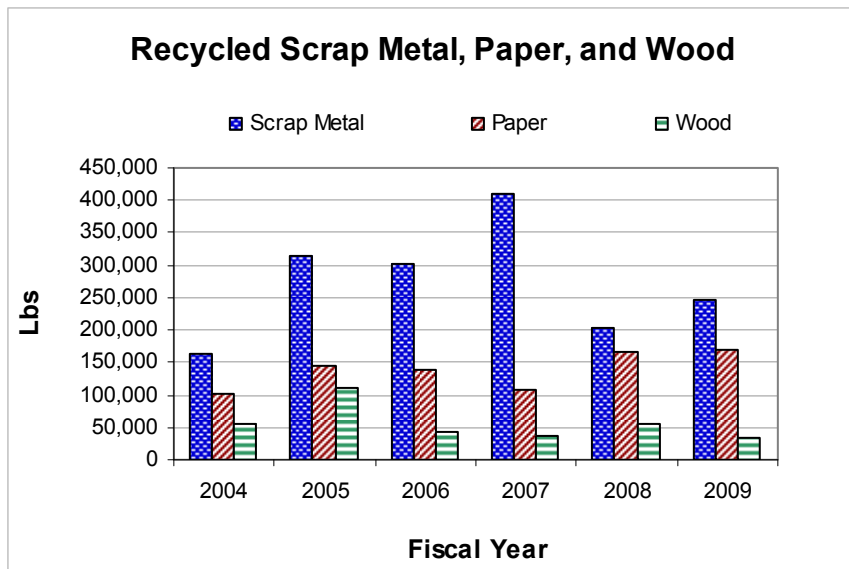


Figure 4-12 Recycled Scrap Metal, Paper, and Wood

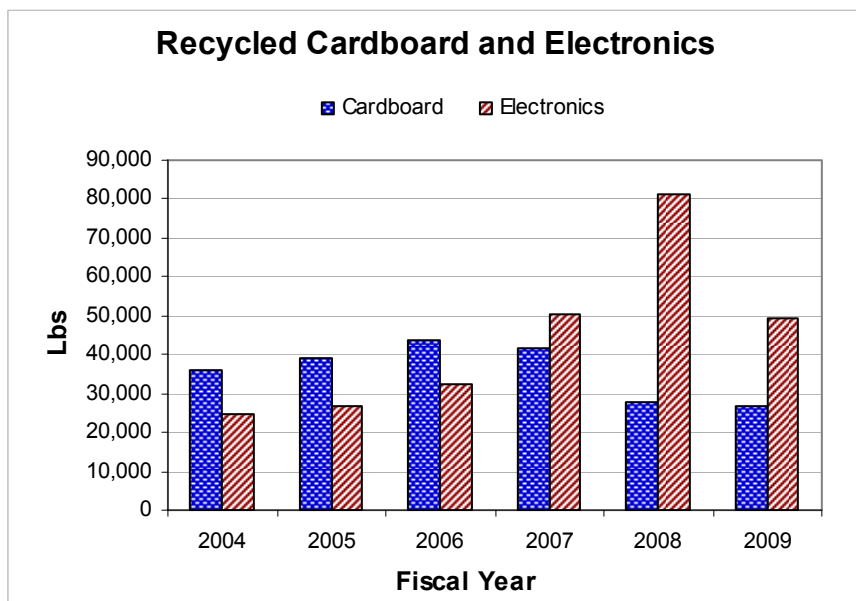


Figure 4-13 Recycled Cardboard and Electronics

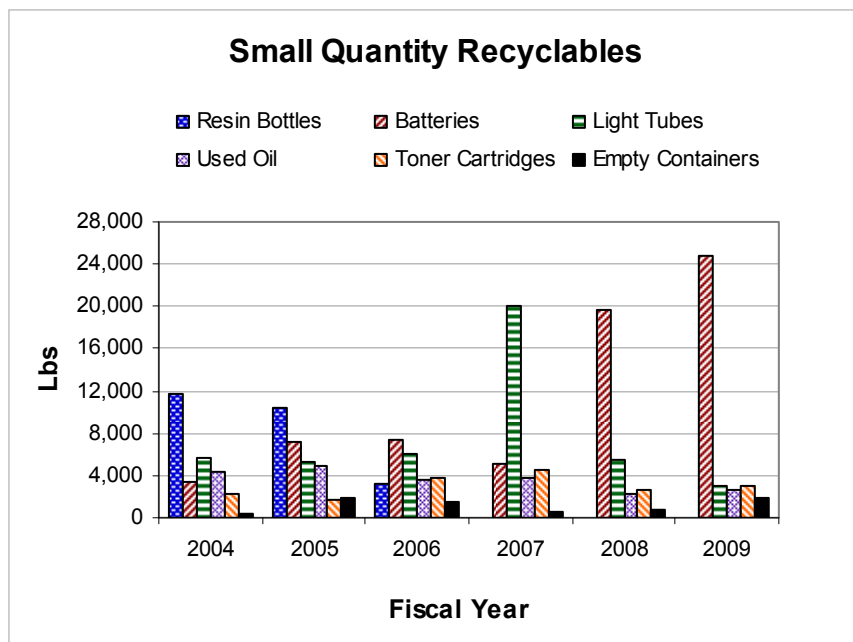


Figure 4-14 Small Quantity Recyclables

***Energy Use Objectives: Minimize site consumption of natural gas and electricity***

SNL/CA defers to the Sandia corporate energy program for targets in support of energy reduction. Activities conducted at SNL/CA during 2009 to support the corporate program focused on communications about energy conservation and monitoring of consumption data. Figure 4-15 shows SNL/CA's energy use since 2004. In general, energy use (when normalized by building square footage) has decreased over the last four years at SNL/CA.

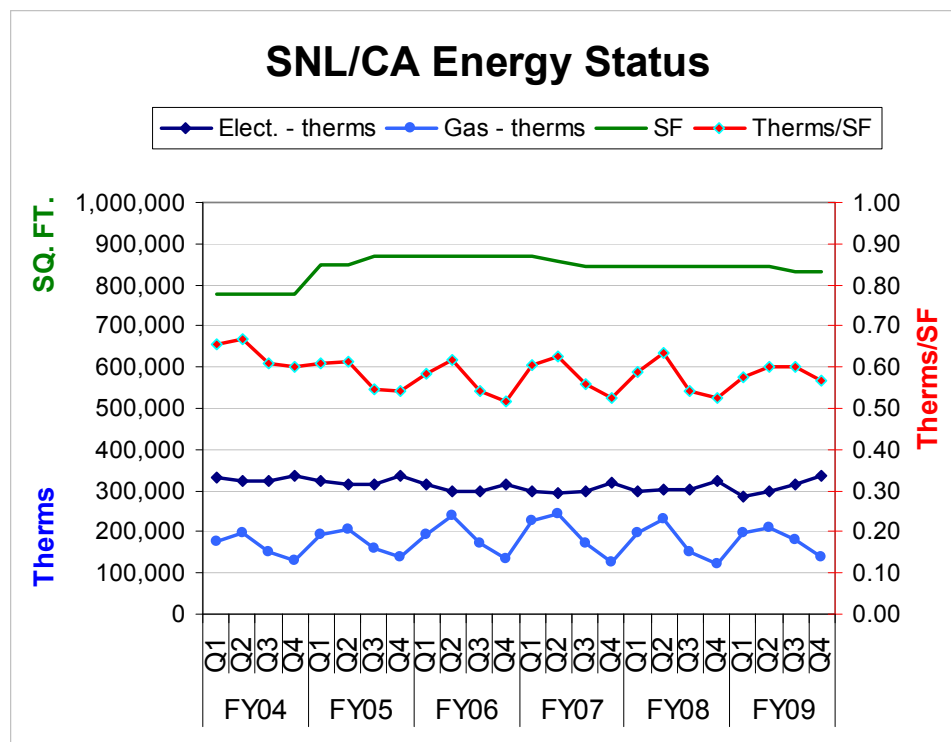


Figure 4-15 SNL/CA Energy Consumption

### ***Water Use Objective: Minimize site water consumption***

Figure 4-16 presents fiscal year water use data for SNL/CA since 2004<sup>7</sup>. In 2009, SNL/CA established a target for reducing water consumption by 26 percent in fiscal year 2020, using fiscal year 2007 data as a baseline. The previous target of 16 percent in fiscal year 2015 was changed to be consistent with the new requirements of Executive Order 13514. Between 2007 and 2009, the site saw a decrease of 15.4 percent in water consumption. The majority of the decrease is the result of changing to smart landscape watering systems that provides for wireless control and adjusts sprinkling days and quantities based on weather conditions. Landscape water accounts for approximately 30 percent of water used on site; consequently, improvements in irrigation systems generate significant reductions in water use.

<sup>7</sup> Data presented in Section 2.4.2 reflects calendar year data and differs from that presented in Figure 4-17 which reflects fiscal year data.

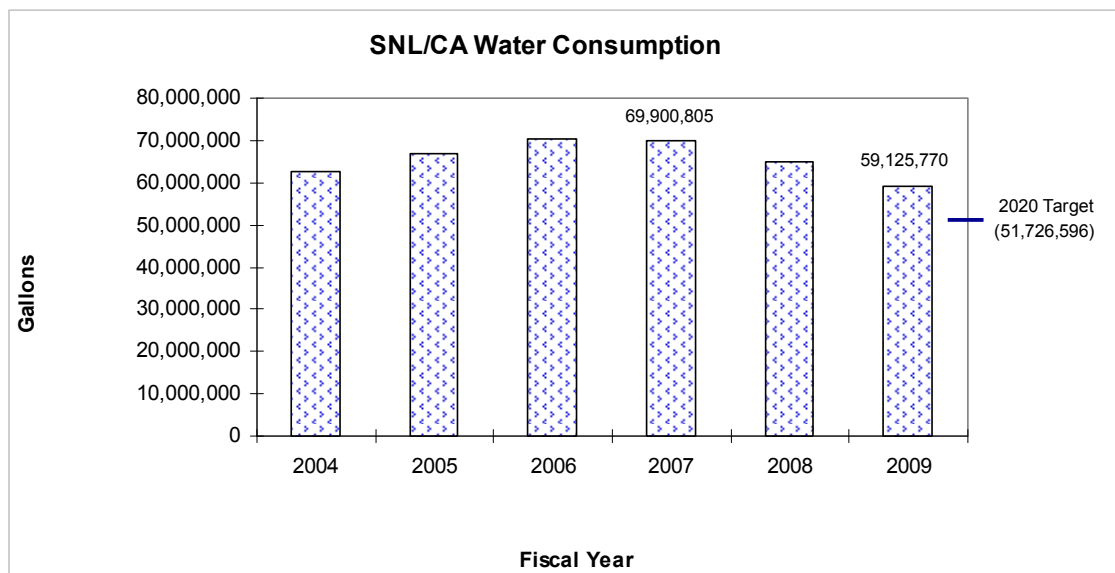


Figure 4-16 Water Consumption at SNL/CA

## 4.3 Functional Environmental Program Highlights

Six functional environmental programs support environmental management at SNL/CA, air quality, environmental monitoring, environmental planning and ecology, hazardous materials management, pollution prevention and waste minimization, and waste management. The following sections summarize the responsibilities of each program and identify the highlights that occurred during 2009.

### 4.3.1 Air Quality Program

The Air Quality Program provides compliance assistance for all nonradiological air emission sources at SNL/CA. Program staff review all directives, laws, and regulations relevant to air emissions for applicability to the site. This program manages the air permit process, from the initial steps of preparing permit applications through implementation of permit conditions and annual renewals. The Air Quality Program is responsible for evaluating proposed projects, assessing chemical use, and assessing emissions of all criteria pollutants and toxic air contaminants.

Federal, state, and local agencies continue to develop measures to reduce exposure to toxic air contaminants and criteria pollutants. In addition, particularly at the state level, efforts are underway to reduce emissions from diesel engines and greenhouse gases such as carbon dioxide (CO<sub>2</sub>) and sulfur hexafluoride. Most of the Air Quality Program's efforts and accomplishments throughout 2009 were related to these topics, and are listed below.

- Timely completion and submission of the BAAQMD Annual Update Package (supporting documentation and data for renewal of BAAQMD Permit To Operate), which included the notification of dismantlement and archival of three permitted sources;

- Closely followed the regulatory development and analyzed applicability to Sandia/CA operations of an unprecedented seventeen (17) new BAAQMD, CARB, EPA regulations and Executive Orders affecting diesel vehicles/equipment and LSI engines, high warming potential GHG usage (SF6 in Gas Insulated Switch Gear, GHG Emissions from Semiconductor Operations, Alternative Suppressants in Fire Protection Systems, Natural Gas Transmission and Distribution GHG Emissions Reduction, SF6 Emissions Reductions from Particle Accelerators, Stationary Equipment Refrigerant Management Program, etc.) hex chrome plating, architectural coatings, boilers, and portable generators;
- Implemented a 5-minute idling policy into our diesel off-road operations;
- Registered our off-road diesel fleet with CARB and labeled equipment with CARB identification numbers;
- Prepared and submitted a permit application to the BAAQMD for a new emergency generator; received operating permit well in advance of the programmatic deadline;
- Developed the Large Spark Ignition (LSI) engine database and analyzed the fleet's emissions; formulated and implemented strategies for complying with current and future regulatory deadlines;
- Developed compliance strategy for testing, insulating, and emissions reductions requirements for our site's 9 boilers;
- During the 2009 Spare The Air season there were 19 fill-ups at the B963 gasoline tank over the 8 (weekday) Spare The Air Days. This is an average of about 2.5 fill-ups per Spare The Air Day, down from an average of 7 on a typical workday. For the fifth consecutive year, the Sandia/CA workforce has met an Air Quality EMS target of maintaining the number of fill-ups on Spare the Air Days to 3 or less.

#### **4.3.2 Environmental Monitoring Program**

The Environmental Monitoring Program routinely monitors wastewater, storm water, and groundwater systems at SNL/CA to assess the affect of site operations on the public and local environment. Monitoring of external radiation at the site perimeter is also conducted under this program. Routine monitoring activities and results are presented in Chapter 5.

During 2009, the Environmental Monitoring Program focused on identifying the source(s) of exceedances in the effluent. Activities completed in 2009 include:

- Extensive sampling of the sewer system and the water distribution system.
- Hiring of a consultant to aid in re-design of the compliance sampling system to ensure that samples collected are representative of the effluent flow.



### 4.3.3 Environmental Planning and Ecology Program

The Environmental Planning and Ecology Program provides oversight for ecological resource management, National Environmental Policy Act reviews, and cultural and historic resource reviews. Each year, the Environmental Planning and Ecology Program compares actual site operations to the maximum operations scenario presented in a site-wide environmental assessment (SWEA) to determine whether SNL/CA operations remain within the bounding impact analysis. Table 4-2 presents a summary of the comparison and an evaluation of the results.

**Table 4-2 Comparison of 2009 Operations with SWEA Envelope**

Activity / Unit	SWEA Envelope (maximum operations)	Calendar Year 2009	Site Operations Remain Within Impact Analysis
<b>Proposed Action</b>			
Site mission	Supports DOE, NNSA, DHS	No change	Yes
Arroyo Seco improvements	20 tasks	14 tasks completed	Yes
Increase operations	Increase to 2 shifts	1 shift	Yes
New facilities	5,000 sf badge office; new 16,000 sf laboratory; 84,000 sf laboratory replacement for Building 916	500 sf as of December 31, 2009 (badge office trailer)	Yes
Demolition	100,000 sf	38,376 sf as of December 31, 2009	Yes
<b>Land Use</b>			
Construction area	93 acres	8 acres as of December 31, 2009	Yes
Wildlife reserve	30 acres	106 acres	Yes – results in a positive effect
<b>Geology / Soil</b>			
Solid waste management units	23 units total	22 units	Yes
Soil removed	5000 cu yd/yr	0 cu yd	Yes
Soil managed onsite	5000 cu yd/yr	< 2000 cu yd	Yes
Backfill material brought onsite	6000 cu yd/yr	<2000 cu yd	Yes
<b>Infrastructure</b>			
Water use	91.8 million gal/yr	59.56 million gals	Yes
Sanitary sewer discharge	29.1 million gal/yr	16.37 million gals	Yes
Natural gas use	94 million cu ft/yr	70,993 million cu ft <sup>e</sup>	Yes
Electricity use	48,800 MW h/yr	36,240 MW hrs <sup>e</sup>	Yes
<b>Biological and Ecological Resources</b>			
Construct flood plains in Arroyo Seco	1800 linear feet	360 linear feet	Yes
Create riparian habitat	0.2 acres	2.54 acres as of December 31, 2009	Yes
Ground disturbance in / along arroyo	10 acres	< 3 acres as of December 31, 2009	Yes
<b>Cultural Resources</b>	None known onsite	No change	Yes

Activity / Unit	SWEA Envelope (maximum operations)	Calendar Year 2009	Site Operations Remain Within Impact Analysis
<b>Proposed Action</b>			
<b>Water Resources</b>			
Impervious surface area	76.9 acres total	53.3 acres	Yes
Irrigation water use	17 million gal/yr	not measured	Unknown <sup>8</sup>
<b>Waste Generation</b>			
Radioactive waste	8,811 kg/yr	13 kg	Yes
Hazardous waste	133,820 kg/yr	41,316 kg	Yes
Construction debris (sub-set of solid waste)	200 tons/yr	1,034 tons - recycled 315 tons - waste	Although greater than projected in SWEA, landfill capacity in the region was not exceeded
Solid waste (non-hazardous, excludes construction debris)	378.7 metric tons/yr	99 metric tons	Yes
<b>Transportation</b>			
Hazardous / radioactive waste shipments	116 shipments/yr	24 shipments	Yes
Non-hazardous waste shipments (solid waste and construction debris)	80 shipments/yr	130 shipments	Although the number of shipments was higher than projected in the SWEA, the 50 additional shipments represents less than 1/10 <sup>th</sup> of a percent of the average daily traffic on area roadways.
<b>Air Emissions</b>			
Total criteria pollutants	8,212 kg/yr	4,850 kg <sup>a</sup>	Yes
Total air toxics	2,880.16 kg/yr	1,050 kg <sup>a</sup>	Yes
Radioactive	0 emissions	0 emissions	Yes
Permits	57 permits annually	15 / 13 permits <sup>b</sup>	Yes
<b>Human Health</b>			
Recordable accidents / injuries	78 accidents / injuries annually	14 accident / injuries <sup>c</sup>	Yes
Lost work-day cases	19 days annually <sup>c</sup>	100 days <sup>c</sup>	No
<b>Socioeconomics</b>			
Employment	Up to 1931 persons annually	988 persons <sup>d</sup>	Yes
Operating budget	\$262 million/yr	225.7 million <sup>e</sup>	Yes

<sup>a</sup> Annual emissions were calculated by multiplying the daily emissions reported in the BAAQMD Permit to Operate by 365. Emissions are based on 2008 data.

<sup>b</sup> Data provided for the 2008/2009 and 2009/2010 permit periods. See Section 3.4.1 for more information.

<sup>c</sup> Extrapolated from historical average.

<sup>d</sup> Sandia employees only. Does not include contract staff. Data from December 2009.

<sup>e</sup> Fiscal year data (October 1, 2008 – September 30, 2009).

#### 4.3.4 Hazardous Materials Management Program

The Hazardous Materials Management Program is responsible for tracking hazardous materials (chemical and biological), managing the Material Safety Data Sheet (MSDS)

<sup>8</sup> Irrigation water is not metered at SNL/CA. Data presented in past reports was estimated. In 2008, this methodology was determined to provide inaccurate calculations of irrigation water use. Sandia currently has no plans to install a water metering system. However, efforts will continue to reduce the quantity of water used for irrigation by installing “smart” control systems.

library, providing MSDS information to site personnel, and for regulatory compliance reporting required under various hazardous materials regulations.

Each year, the Hazardous Materials Management Program conducts an annual hazardous material inventory reconciliation. In 2009, the reconciliation team achieved a 95 percent “found rate”, the same as in 2008. This is the highest rate achieved since annual reconciliations began over ten years ago. This result meets the SNL/CA EMS performance target of > 94 percent.

#### **4.3.5 Pollution Prevention and Waste Minimization Program**

The Pollution Prevention and Waste Minimization Program promotes the elimination or reduction of all waste types generated at SNL/CA. Program staff work closely with other SNL/CA organizations to establish routine and project-specific recycling programs. The program provides guidance for resource and energy conservation and assists in identifying recycled-content products for use throughout the site. See Section 4.1 for recycling and waste minimization data.

During 2009, SNL/CA implemented improvements in the process for the collection of used batteries. This change was made to better monitor compliance with universal waste regulations. Implementation of the new process included distribution of distinctive collection containers with proper labeling and markings. Accumulation dates on the containers are monitored by the Pollution Prevention Team.

A Virtual Earth Day was sponsored by the Pollution Prevention Team in April. Our Virtual Earth Day Web Site included general information about Earth Day, an environmental footprint exercise for individuals, the opportunity to pledge to improve behavior to be more environmentally aware, information on green travel, cars, organic foods, and finally links to surrounding cities’ activities.

The Pollution Prevention Team assisted with the development of a new process for evaluating excess equipment for hazards prior to transport into Property Reapplication. This new process requires the equipment owner to declare the hazards by completing a checklist. The hazard evaluation is coordinated by a single point of contact and hazards are mitigated to avoid spills to the environment and contamination to site personnel.

By encouraging the Sandia workforce to consider excess materials and chemicals as the first sources of supply, the Pollution Prevention Team successfully reapplied a number of items during 2009. Items included chemical storage sheds, ammunition, scintillation equipment and shielding. Successful reapplication resulted in avoiding hazardous, low-level radioactive, and solid waste generation.

#### **4.3.6 Waste Management Program**

The Waste Management Program manages hazardous, radioactive, and mixed wastes generated by SNL/CA operations. Program personnel collect waste from the point of generation and transfer waste to onsite waste storage facilities for storage, consolidation,

commingling, and packaging. The Waste Management Program establishes and maintains several contracts for offsite reclamation, recycling, treatment, and disposal of wastes. Waste Management provides regulatory oversight in accordance with federal, state, and local regulations. The Program manages the Resource Conservation and Recovery Act (RCRA) and Tiered permit process, and implements RCRA and Tiered permit conditions. Program staff conduct process knowledge evaluations to characterize waste types generated from specific operations. The Waste Management Program also provides waste generator training to the Sandia workforce.

The Waste Management Program also supported the site-wide old chemicals reduction campaign conducted July 2009 through September 2009. This campaign was led by the Hazardous Materials Management Program and continued active support for SNL/CA's efforts to minimize old, unneeded chemicals in inventory and minimize routine hazardous waste generation.

## 5 Environmental Monitoring

Sandia National Laboratories, California (SNL/CA) monitors storm water, wastewater, groundwater, and gamma radiation. This chapter provides a summary of monitoring activities and results for each of these media. Both radiological and non-radiological data are presented.

SNL/CA does not directly monitor airborne effluents. Non-radiological (chemical) emission sources do not require routine or continuous monitoring of ambient air quality concentrations. However, SNL/CA does maintain equipment and process usage records (e.g. hours of operation or quantity of solvents used) for emission sources. Similarly, there are no radionuclide emission sources that require routine monitoring. SNL/CA maintains an inventory of radioactive isotopes (small quantity sealed and unsealed sources), and operates several radiation generating devices. Emission monitoring is not required for these materials and devices.

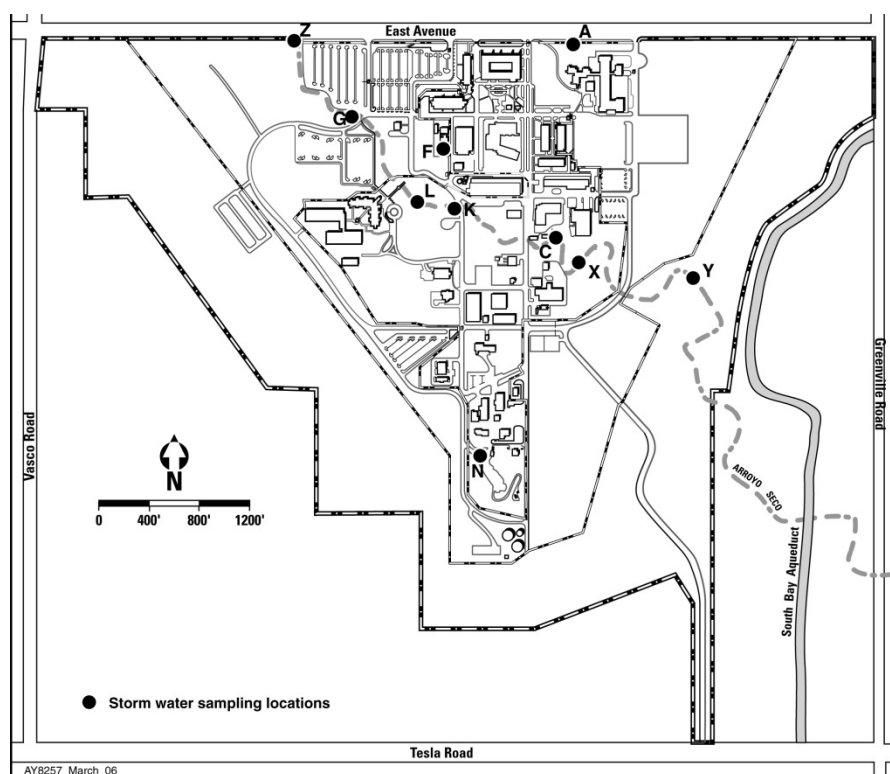
Typically, radiological emission data that would be obtained from radionuclide effluent monitoring is used to evaluate the potential effect that a particular site's operations may have on local populations and the environment. Because there are no radionuclide emission sources and no monitoring data for site operations, calculations for maximum individual dose or collective population dose are not possible. As an alternative to these calculations, SNL/CA compares gamma radiation data collected at the site perimeter to offsite data. Results of this comparison are presented in Section 5.4.

SNL/CA is not required to monitor biota or vegetation. The Department of Energy (DOE) RAD-BCG Calculator, a computer tool developed by DOE, is used each year to determine the need and level of monitoring required. The results from applying the tool in 2009 are presented in Section 5.4.

### 5.1 Storm Water

All storm water runoff from SNL/CA is conveyed to the Arroyo Seco, which discharges into Alameda Creek and eventually to the San Francisco Bay. Storm water that flows off buildings, material-handling areas, parking lots, and other impervious surfaces, may pick up pollutants, such as oil and grease, soil, litter, pesticides, and fertilizers. During heavy or continuing storms, runoff may transport pollutants to Arroyo Seco before the storm water has time to evaporate or infiltrate into the ground.

To assess the impact of site operations to storm water discharges, SNL/CA collects samples of surface runoff at nine locations around the site. These locations, identified on Figure 5-1, were selected because they provide the best representation of drainage areas and activities onsite. Each of the nine locations is sampled twice each wet season, once each during two



**Figure 5-1 Storm Water Sampling Locations**

separate storm events, provided there is sufficient runoff. The wet season is from October 1 through May 31. Because any one storm may not produce enough runoff to allow for sample collection at all nine locations, sampling during more than two storm events is generally required.

One additional sampling location, Station N, is used to monitor erosion from the Navy Landfill, but is not sampled for the storm water program. During the 2008/2009 rainy season, Station N was sampled.

Storm water discharges at SNL/CA are covered under the State of California NPDES General Permit for Storm Water Discharge Associated with Industrial Activities (General Permit) (California Water Resources Control Board 1997). The General Permit does not establish water quality standards for storm water discharges. Consequently, a comparison of analytical results with regulatory standards cannot be made. Instead, the analytical data obtained from monitoring storm water discharge is used to optimize storm water pollution prevention activities at SNL/CA.

#### Analytical Parameters – Stormwater

- Specific conductivity
- pH
- Total suspended solids
- Oil and grease
- Cyanide
- Metals
- Chemical oxygen demand
- Nitrite + nitrate
- Ammonia
- Tritium

Analytical results of storm water sampling for the 2008/2009 wet season are presented in Table 5-1. No pollutants were detected in storm water runoff at levels that are a cause for concern. The concentrations of constituents detected in storm water are similar to those detected historically.

**Table 5-1 Summary of Analytical Results for Storm Water, 2008/2009 Wet Season**

Parameter	Number of Samples Analyzed	Number Found Below Detection Limit	Detection Limit	Minimum Concentration	Maximum Concentration
Total suspended solids	17	2	1 mg/L	<1 mg/L	108 mg/L
Specific conductivity	17	2	10 µmho/cm	<10 µmho/cm	78.8µmho/cm
pH	17	0	None	6.85	8.2
Oil and grease	17	17	5 mg/L	<5 mg/L	<5 mg/L
Chemical oxygen demand	17	4	10 mg/L	<10 mg/L	75 mg/L
Cyanide	17	14	0.001 mg/L	<0.001 mg/L	0.0025 mg/L
Tritium	17	17	820 - 919 pCi/L	<820 pCi/L	<919 pCi/L
Aluminum	17	0	0.05 mg/L	0.16 mg/L	5.0 mg/L
Arsenic	17	4	0.0005 mg/L	<0.0005 mg/L	0.0015 mg/L
Cadmium	17	11	0.00025 mg/L	<0.00025 mg/L	0.00042 mg/L
Iron	17	0	0.02 mg/L	0.22 mg/L	6.5 mg/L
Lead	17	0	0.0005 mg/L	<0.00098 mg/L	0.0094 mg/L
Magnesium	17	0	0.02 mg/L	0.44 mg/L	4.7 mg/L
Mercury	17	4	0.000012 mg/L	<0.000012 mg/L	0.0013 mg/L
Selenium	17	17	0.0005 mg/L	<0.0005 mg/L	<0.0005 mg/L
Silver	10	10	0.00019 mg/L	<0.00019 mg/L	<0.00019 mg/L
Zinc	17	0	0.005 mg/L	0.023 mg/L	0.16 mg/L
Ammonia-N	17	12	0.2 mg/L	<0.2 mg/L	0.37 mg/L
Nitrite + nitrate	17	4	0.1 / 0.45 mg/L	<0.1/<0.45 mg/L	0.9 mg/L

Annually, SNL/CA evaluates storm water pollution prevention practices at each drainage location as part of its monitoring activities. No practices that would cause a threat to the storm water were observed.

During years of sufficient runoff, SNL/CA compares the analytical results from storm water entering the site to storm water exiting the site. For the 2008/2009 storm season, there was insufficient runoff to collect a sample of storm water entering the site. Consequently, a comparison could not be made.

## 5.2 Wastewater

Wastewater effluent generated at SNL/CA consists of sanitary and laboratory discharges. Sanitary effluent is discharged directly to the sewer system. Sewer discharges exit the site through a sewer outfall located at the northern boundary, and join with the Lawrence Livermore National Laboratory (LLNL) sewer system. Laboratory discharges are generated from general research activities, and from operations that qualify as categorical processes

subject to Federal pretreatment standards. Laboratory effluent from most laboratory areas is diverted to liquid effluent control system (LECS) holding tanks prior to discharge to the sanitary sewer. SNL/CA monitors wastewater at the sewer outfall, LECS tanks, and at categorical process point sources.

### 5.2.1 Sewer Outfall

SNL/CA operates a sewer outfall and monitoring station at the northern site boundary to continuously monitor wastewater for flow and pH. Samples are also collected at the outfall to monitor compliance with wastewater discharge limits established in the site's *Wastewater Discharge Permit*. The outfall sampling schedule and analytical parameters are presented in Table 5-2. Consistent with permit requirements, SNL/CA does not analyze wastewater samples collected at the sewer outfall for radioactive constituents.

**Table 5-2 Sewer Outfall Sampling Schedule, 2009**

Frequency	Sample Type	Analytical Parameter
Daily	Composite	Archive sample; analyzed only when weekly composite sample shows concentration greater than or equal to 50% of discharge limit for metals.
Weekly	Composite	Metals
Monthly	Composite	Total dissolved solids Total suspended solids Biochemical oxygen demand Chemical oxygen demand <sup>a</sup>
Monthly	Grab	Cyanide EPA priority organic pollutants

<sup>a</sup> Chemical oxygen demand analyses are not required by the Wastewater Discharge Permit.

A summary of analytical results for physical parameters and metals from the SNL/CA sanitary sewer outfall is presented in Table 5-3. In 2009, all liquid effluent from the outfall complied with the site outfall discharge limits for regulated physical parameters and most metals. The site exceeded the discharge limit for copper, lead, and zinc on February 9 and 10, and for copper on September 8. Not all of these exceedances are reflected in Table 5-3 data because the table presents data for weekly composite samples. The exceedances were found in the daily samples collected on the dates above. Additional information about the exceedance is presented in Section 3.13.



**Table 5-3 Weekly Composite Sewer Outfall Monitoring Results – Physical Parameters and Metals, 2009**

Parameter	Number of Samples Analyzed	Quantity Found Below Detection Limit	Detection Limit	Sewer Discharge Limit	Minimum Concentration	Maximum Concentration
Total suspended solids	12	0	1 mg/L	None	159 mg/L	740 mg/L
Total dissolved solids	12	0	10 mg/L	None	137 mg/L	1160 mg/L
Biochemical oxygen demand	12	0	4 mg/L	None	92 mg/L	810 mg/L
Chemical oxygen demand <sup>a</sup>	12	0	10 mg/L	None	300 mg/L	1700 mg/L
Cyanide	12	0	0.001 mg/L	0.04 mg/L	0.001 mg/L	0.017 mg/L
Arsenic	52	2	0.0005 - 0.02 mg/L	0.06 mg/L	0.00065 mg/L	0.0019 mg/L
Cadmium	52	5	0.00025 – 0.005 mg/L	0.14 mg/L	<0.00025 mg/L	0.02 mg/L
Chromium	52	2	0.0005 – 0.005 mg/L	0.62 mg/L	0.0005 mg/L	0.33 mg/L
Copper	52	0	0.0005 mg/L	1 mg/L	0.1 mg/L	5.6 mg/L
Lead	52	2	0.0005 – 0.02 mg/L	0.2 mg/L	0.0005 mg/L	0.27 mg/L
Mercury	52	2	0.000012 – 0.0008 mg/L	0.01 mg/L	0.000012 mg/L	0.00066 mg/L
Nickel	52	1	0.0005 – 0.005 mg/L	0.61 mg/L	0.0018 mg/L	0.29 mg/L
Silver	52	7	0.00019 – 0.005 mg/L	0.2 mg/L	0.00019 mg/L	0.011 mg/L
Zinc	52	0	0.005 mg/L	3 mg/L	0.082 mg/L	6.2 mg/L

<sup>a</sup> Chemical oxygen demand analyses are not required by the Wastewater Discharge Permit.

Sewer outfall samples are also analyzed for priority pollutants that are listed by the U.S. Environmental Protection Agency (EPA) as toxic organics. Because the list is lengthy, SNL/CA routinely reports only positively identified organic constituents. In 2009, sewer outfall samples showed concentrations of chloroform (<0.5 – 4.0 µg/L), bromoform (0.51 – 5.2 µg/L), dibromochloromethane (2.4 µg/L), toluene (0.75 – 0.76 µg/L), bromodichloromethane (0.86 µg/L), and 3, and/or 4-Methylphenol(m,p-cresol) (16 µg/L). All other constituents on the EPA toxic organic list were below minimum detection limits. The toxic organic discharge limit for the site is 1000 µg/L. In 2009, SNL/CA did not exceed this discharge limit. Detailed sewer analyses results are provided in Section 9.

## 5.2.2 Liquid Effluent Control System

Effluent from major laboratory facilities is diverted to LECS holding tanks where wastewater can be sampled and analyzed prior to release to the sewer system. SNL/CA operated five LECS during 2009. Wastewater from LECS tanks is typically analyzed for metals. Analyses for other parameters associated with the process generating the wastewater may also be done. Four of the five LECS tanks are also continuously monitored for pH. One LECS tank that is

used infrequently is monitored prior to discharge for tritium and uranium. The tank did not require discharge in 2009; consequently, analyses for radioactive constituents were not necessary.

Wastewater that does not meet the discharge limits at the sewer outfall is transferred to Waste Management for disposal. Depending on the constituents of the wastewater, it may be disposed as hazardous or non-hazardous waste. In 2009, SNL/CA disposed of two tanks of wastewater, approximately 3,100 and 4,100 gallons respectively, through Sandia's Waste Management Program. The wastewater contained levels of copper and zinc (one tank each) that were too high to discharge to the sanitary sewer. SNL/CA's Environmental Monitoring Program initiated an investigation to identify the source of copper, but was unable to locate the source. The source of the zinc was determined to be from floor stripping operations.

### 5.2.3 Categorical Processes

Three research operations at SNL/CA are defined as federal categorical processes subject to the EPA's pretreatment standards for point sources (40 CFR Part 403, 40 CFR Part 433). These categorical processes include two metal finishing operations and a semiconductor manufacturing operation.<sup>9</sup> Wastewater from the semiconductor manufacturing operation is sampled semiannually. The two metal finishing operations are closed-loop systems that do not discharge effluent to the sanitary sewer, and, therefore, wastewater monitoring is not required. There is an additional laboratory that may infrequently use metal cyanide complexes for electroplating, but this is done on a very small scale (less than 50 mL), and all liquid waste is handled as hazardous waste. There is no discharge from this process.

Samples collected from the semiconductor manufacturing operation are analyzed for pH, arsenic, and toxic organic pollutants. Table 5-4 presents a summary of semiannual monitoring results for the semiconductor manufacturing operation. In 2009, all wastewater from this operation met the pretreatment standards.

**Table 5-4 Monitoring for Semiconductor Manufacturing Categorical Process, 2009**

Parameter	Number of Samples Analyzed	Number Found Below Detection Limit	Detection Limit	Minimum Concentration	Maximum Concentration	Permit Limit <sup>a</sup>
pH	2	--	None	4.88	6.8	5-10
Arsenic	2	2	0.0005 mg/L	<0.0005 mg/L	<0.0005 mg/L	2.09 mg/L
Total toxic organics	2	--	Range <sup>b</sup>	All below detection limit	All below detection limit	1.37 mg/L <sup>c</sup>

<sup>a</sup> Permit limit for site outfall.

<sup>b</sup> Detection limits for the various organics included in this value range from 0.005 to 0.130 mg/L.

<sup>c</sup> The limit for total organics is a daily maximum concentration.

<sup>9</sup> The semiconductor manufacturing operation is a research and development activity exempt from local air pollution regulations.

## 5.3 Groundwater

SNL/CA has seven groundwater monitoring wells. Sandia monitors groundwater at two former restoration areas and along Arroyo Seco. Three groundwater monitoring wells are used to monitor residual contamination at former restoration areas under a 1989 site clean-up order issued by the Regional Water Quality Control Board, San Francisco Bay Region (RWQCB). Two of these wells are located at the Fuel Oil Spill site, and one at the Navy Landfill. Four monitoring wells are located along Arroyo Seco to monitor the effect of site operations on groundwater quality. Well AS-4 is located up gradient of the developed area of the site and provides background data about local groundwater quality. Groundwater monitoring well locations are shown on Figure 5-2. MW-406, an LLNL well, is also shown on Figure 5-2. SNL/CA discontinued monitoring at this location in 2005, but continues to report the results of LLNL's monitoring efforts that occur every two years. Table 5-5 provides the sampling schedule for each SNL/CA well location.

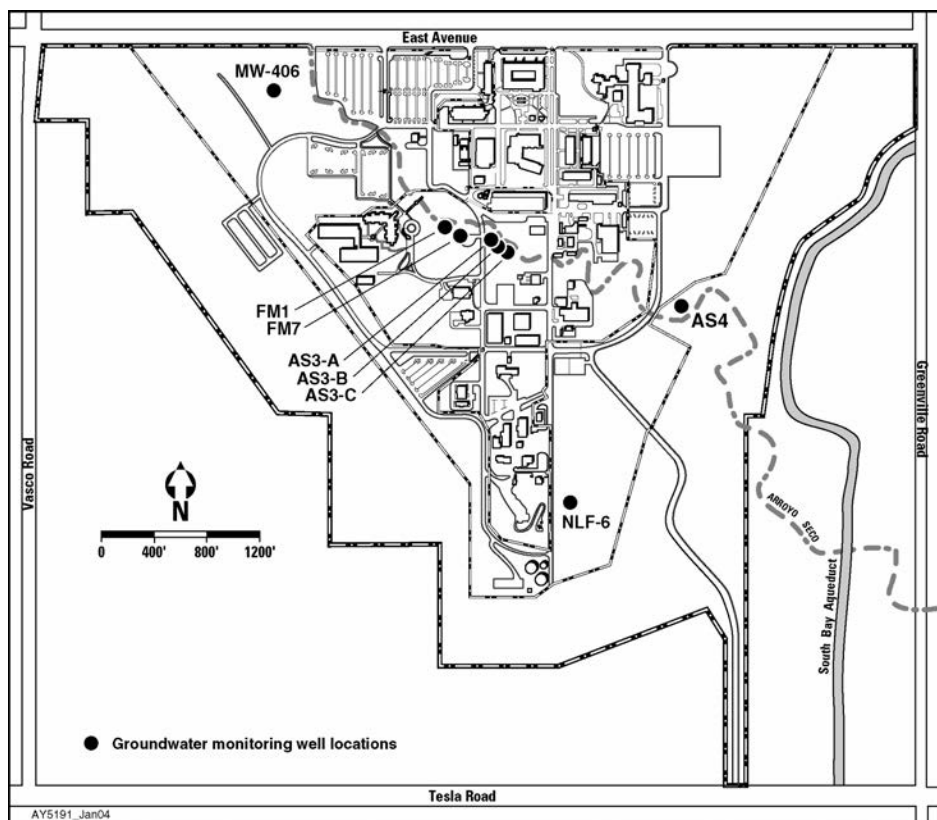


Figure 5-2 Groundwater Monitoring Well Locations

**Table 5-5 Groundwater Sampling Schedule, 2009**

Well location	Sampling frequency	Analytical parameter
Fuel Oil Spill site (Wells FM-1, FM-7)	Semi-annually	Total petroleum hydrocarbons diesel-methane (TPHD) (8015); water elevation
Navy Landfill (Well NLF-6)	Annually	Volatile halogenated organics (EPA 601); water elevation
Arroyo Seco (Wells AS-3A, AS-3B, AS-3C, and AS-4)	Annually	Metals, volatile halogenated organics (EPA 601), total petroleum hydrocarbons-diesel (8015), tritium, water elevation
Arroyo Seco (Wells AS-3A, AS-3B, AS-3C, and AS-4)	Every two years	General minerals

Table 5-6 presents a summary of groundwater analytical results for the Navy Landfill. Groundwater analytical results for Arroyo Seco wells are summarized in Table 5-7. All wells at the Fuel Oil Spill had insufficient water for sampling during 2009; consequently, no samples were collected<sup>10</sup>. LLNL sampled MW-406 in December 2009. The only constituent of interest detected was tetrachloroethene at 2 µg/L. Complete groundwater analytical results are provided in Chapter 9. As a point of reference, analytical results are compared to federal and state maximum contaminant levels (MCLs), which are applicable for drinking water sources. There are no wells at SNL/CA used as a source for drinking water and MCLs are not standards applied to groundwater at the site.

As in past years, SNL/CA continued to detect carbon tetrachloride at the Navy Landfill well (NLF-6) in 2009. The concentration was above the state MCL of 0.5 µg/L, but below the federal MCL of 5.0 µg/L. The result is similar to that detected in past years.

**Table 5-6 Summary of Groundwater Analyses at Navy Landfill, 2009**

Date	Trichloromethane <sup>a</sup> (chloroform) µg/L	Carbon Tetrachloride <sup>a</sup> µg/L	Tetrachloroethene <sup>a</sup> (PCE) µg/L
Detection limit	0.5	0.5	0.5
MCL – California		0.5	5
MCL – Federal	100	5	5
<b>Navy Landfill</b>			
NLF-6 4/2/09	0.5	0.77	ND

<sup>a</sup> All other EPA 601 parameters were non-detectable.  
MCL – Maximum contaminant levels.

<sup>10</sup> The wells at the FOS have been dry five consecutive years.

**Table 5-7 Summary of Groundwater Analyses at Arroyo Seco Wells, 2009**

				CCR Metals <sup>a</sup>											Tritium pCi/L
				Antimony mg/L	Arsenic mg/L	Barium mg/L	Chromium mg/L	Copper mg/L	Lead mg/L	Mercury mg/L	Molybdenum mg/L	Nickel mg/L	Vanadium mg/L	Zinc mg/L	
Date	EPA 601	Diesel (8015) µg/L			0.1	0.1	0.1	0.1	0.05	0.1	2	0.02	2	0.1	500
Detection limit		50													
MCL - California						1	1		0.05						
MCL – Federal						2									
AS-3A	4/2/09	ND	ND	ND	0.0012	0.13	0.014	0.0021	0.0033	0.000081	0.0039	0.0021	0.0037	0.0069	<310
AS-3B	4/2/09	ND	ND	ND	0.00074	0.14	0.009	0.0015	ND	0.000059	0.0037	ND	0.0023	ND	<310
AS-3C	4/2/09	ND	ND	0.0016	ND	0.14	0.006	0.0011	0.00084	0.00011	0.0054	ND	ND	0.011	<310
AS-4	4/2/09	ND	ND	ND	0.0012	0.082	ND	0.0013	ND	0.000013	0.0032	0.00058	0.0025	ND	<310

<sup>a</sup> All other California Code of Regulations (CCR) parameters were non-detectable.  
MCL – Maximum contaminant levels.  
ND – Non-detectable.

## 5.4 Biological Dose Assessment

To meet the requirements of DOE Order 450.1A and 5400.5, SNL/CA conducts a biological dose assessment each year using the graded approach presented in *DOE Standard 1153-2002 A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota* (DOE 2002). The technical standard includes models for calculating doses from radionuclide concentration data obtained from sediment and water analyses. In 2009, the RAD-BCG Calculator, a computer tool developed by DOE, was used to calculate doses and determine the need for and level of monitoring required.

The first step in the graded approach is a general screening that compares concentrations of radionuclides in environmental media with derived concentration guides. The ratios of the concentrations to the concentration guides are then summed. If the total equals or exceeds one, then additional analyses are required.

The radionuclides handled in greatest quantity at SNL/CA during past or present operations are tritium and depleted uranium. Typically, SNL/CA uses tritium data from storm water sampling in the RAD-BCG Calculator. However, because tritium was not detected above analytical detection limits in storm water samples collected in 2009, the detection limit value was used. The sum of fractions from storm water data totaled  $3.47 \times 10^{-6}$ . This small fraction indicates that further analysis is not required and that SNL/CA is not required to monitor aquatic or terrestrial biota.

## 5.5 Radiation Monitoring

SNL/CA monitors gamma radiation to ensure that site operations are not contributing significantly to the ambient radiation dose in the surrounding environment. Onsite sources that could contribute to gamma radiation include small, unsealed radioactive isotopes, sealed sources, and several radiation generating devices. SNL/CA maintains four onsite monitoring stations equipped with thermoluminescent dosimeters. Monitoring stations are shown on Figure 5-3. The dosimeters are collected and evaluated quarterly. The data obtained from Sandia monitoring stations is combined with that from LLNL monitoring stations located around the perimeter of the Sandia site to determine the average annual gamma radiation dose at the site perimeter. The combined dose is then compared to the average annual gamma radiation dose at more distant locations in the Livermore Valley, shown on Figure 5-4. If site operations were contributing significantly to the gamma radiation dose, the dosimeters at the site perimeter would show a higher dose than those at more distant locations.

In 2009, the average annual perimeter dose was 61.8 mrem (0.62 mSv). The average annual dose measurement for distant locations was 56.2 mrem (0.56 mSv). The 2009 data for both perimeter and distant locations are within the range measured over the last fifteen years. Since 1994, the average annual dose at the SNL/CA perimeter ranged from 54.3 mrem to 68 mrem. Over this same period, the average annual dose measured at distant locations ranged from 53.4 mrem to 73 mrem.

The difference between the perimeter and distant location measurements for 2009 is not statistically significant. SNL/CA does not appear to be a contributor to gamma radiation dose in the surrounding environment.

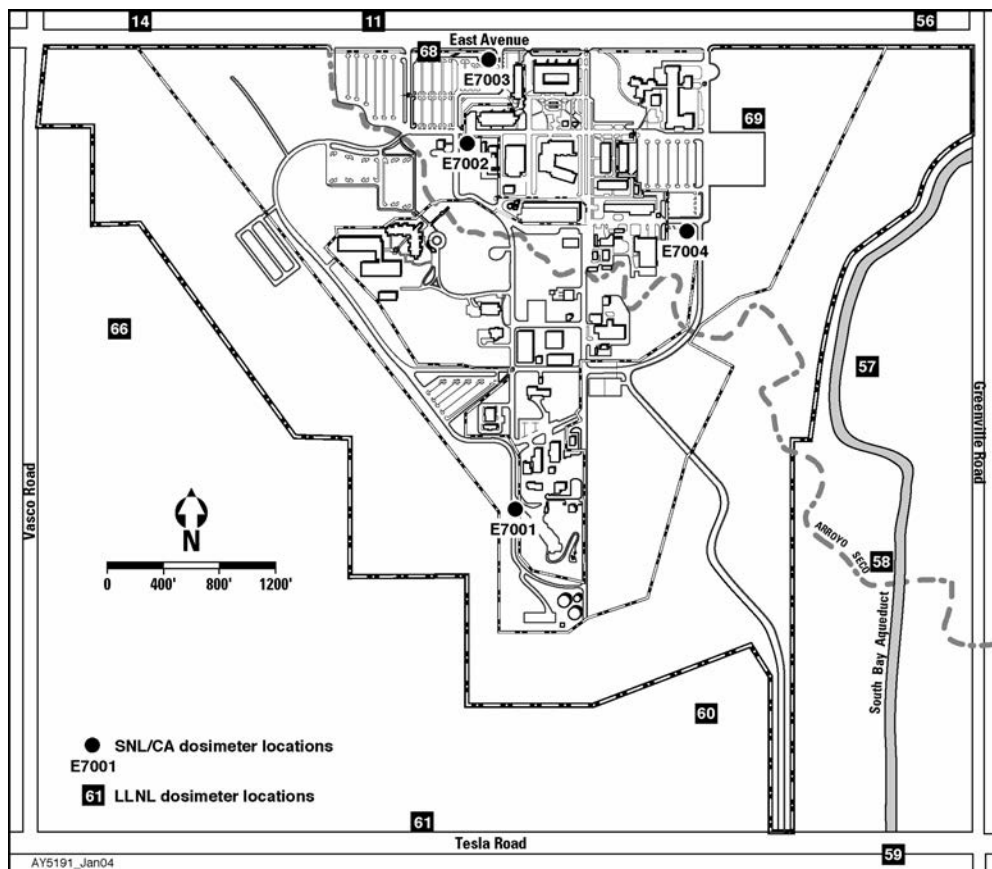


Figure 5-3 Dosimeter Locations at SNL/CA and Around Site Perimeter

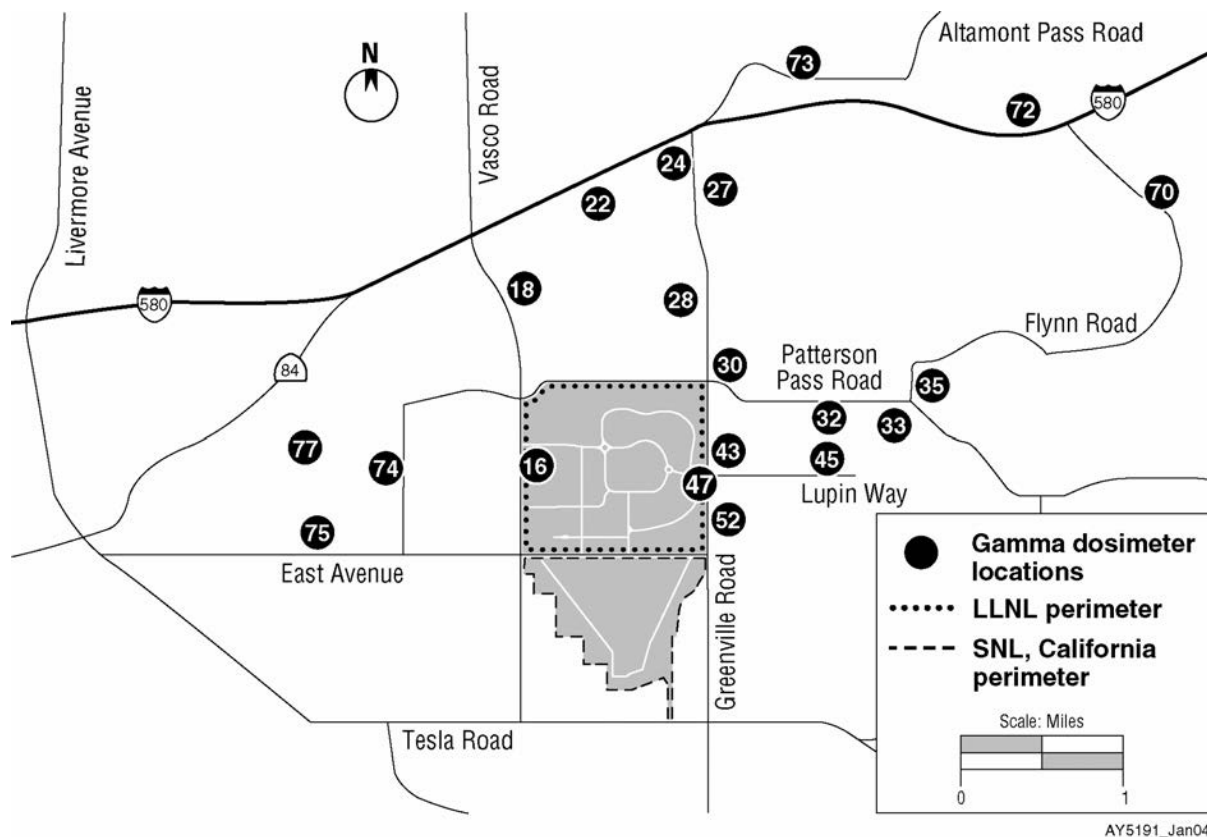


Figure 5-4 Dosimeter Locations in Livermore Valley



## 6 Quality Assurance

Sandia National Laboratories, California (SNL/CA) follows the Sandia Corporate Quality Assurance Program defined in Corporate Procedure: CG100.5.1 (SNL 2009b). Compliance with the corporate Quality Assurance Program satisfies the requirements established in the Department of Energy (DOE) Nuclear Safety Management Regulations, Subpart A, Quality Assurance Requirements (10 CFR 830), and *DOE Order 414.1C, Quality Assurance* (DOE 2005). The Environmental Management Department maintains a Quality Assurance Project Plan that describes the general quality requirements for SNL/CA environmental programs. Program-specific quality requirements are presented in annual program reports and implemented through operating procedures.

**DOE Order 414.1C identifies ten criteria that are integral to a quality program:**

- Quality assurance program
- Personnel training and qualification
- Quality improvement process
- Documents and records
- Established work processes
- Established standards for design and verification
- Established procurement requirements
- Inspection and acceptance testing
- Management assessment
- Independent assessment

### 6.1 Environmental Monitoring Quality Assurance

The Environmental Monitoring Program ensures quality in its activities through implementation of quality assurance plans and procedures. A program-specific quality assurance project plan (QAPP) addresses each of the ten criteria listed above, and documents quality assurance activities performed for the program (SNL/CA 2005). The SNL/CA Environmental Monitoring Annual Program Report provides a detailed description of the monitoring and surveillance activities conducted at SNL/CA (SNL/CA 2009a). Additional program operating procedures specify training requirements, establish work processes, define data verification and validation processes, and identify reporting and records management requirements. The operating procedures are reviewed by subject matter experts and approved by the Environmental Management Department Manager.

### 6.2 Environmental Sampling

Protocols for environmental sampling at SNL/CA are contained in activity specific operating procedures. Elements of these protocols include appropriate sampling methods and equipment; sampling frequency; sampling locations; and sample handling, storage, and packaging. Implementation of established protocols ensures that samples are representative of the environmental medium monitored and that monitoring requirements outlined in permits, DOE orders, and regulations are met. Chain-of-custody protocols are also used to ensure quality control through proper transfer of samples from the point of collection to the analytical laboratory.

## 6.3 Sample Analyses

Analyses of samples collected at SNL/CA are performed using one of three avenues, depending on the sample medium or constituent analyzed. The three avenues are: a State accredited laboratory; the SNL/CA Health Protection Laboratory; or the Sandia National Laboratories, New Mexico (SNL/NM) Health Instrumentation Laboratory.

### 6.3.1 Accredited Laboratory

A State of California accredited laboratory performs analyses of non-radiological samples collected at SNL/CA. To receive accreditation, a laboratory must implement a quality assurance plan. These laboratories are periodically inspected by the California Environmental Protection Agency to ensure that they are operating within regulatory and quality assurance requirements. Consistent with industry standards, non-radiological samples are processed according to federal Environmental Protection Agency methods.

### 6.3.2 SNL/CA Health Physics Laboratory

Tritium analyses of storm water are performed by the SNL/CA Health Protection Department in an onsite laboratory. These samples are analyzed by liquid scintillation counting, a standard technique for tritium analysis. The Health Physics Laboratory follows the guidance in the Sandia National Laboratories (SNL) Radiation Protection Department Quality Assurance Plan (SNL 2009a), and meets the Sandia and DOE quality criteria.

### 6.3.3 SNL/NM Health Instrumentation Laboratory

Thermoluminescent dosimeters used to collect gamma radiation measurements are processed by the Health Instrumentation Department at SNL/NM following established protocols and quality assurance/quality control requirements under the SNL Radiation Protection Department Quality Assurance Plan (SNL 2009a). Automated equipment is used to process the samples and analyze the resulting data.

## 6.4 Data Verification and Validation

SNL/CA conducts data verification and validation to ensure that environmental data is precise, accurate, representative, comparable, and complete. Verification and validation are accomplished through analyses of quality control samples and by conducting statistical analyses.

### 6.4.1 Quality Control Samples

Types of quality control samples prepared for the Environmental Monitoring Program include duplicate, spiked, and blank samples. A definition of each sample type follows.

*Duplicate samples* are collected at the same time and location, and follow the same method, as a routine sample. These samples are used to assess the precision of sample collection and analytical processes.

*Spiked samples* resemble a routine sample, but contain a known amount of one or more of the constituents of interest. These samples are obtained from an independent laboratory that certifies the concentration of the constituents.

*Blank samples* resemble a routine sample matrix (e.g. deionized water is used for blank water samples), but lack the constituents of interest. These samples are used to assess background levels of constituents, and possible contamination of the samples in the laboratory or in the field.

SNL/CA's goal for number of quality control samples is 20 percent of the total sample load, where feasible. This includes quality control samples initiated at the laboratory. In 2009, SNL/CA collected fourteen wastewater quality control samples representing 27 percent of the sample load. Two groundwater quality control samples were collected representing 20 percent of the sample load. Four storm water quality control samples were collected during the 2008/2009 wet season, representing 24 percent of the sample load.

## **6.4.2 Statistical Analyses**

Statistical analyses are used to determine completeness, precision, and accuracy of monitoring and surveillance data. Prior to performing statistical analyses, the data is normalized to ensure that valid results are obtained. Descriptions of the statistical tests follow.

Completeness is evaluated by determining the ratio between the number of samples collected and the number of samples scheduled for collection. The data quality objective for completeness is 85 percent.

Precision is evaluated using three methods: determining the ratio between routine and duplicate samples; tests of significant difference; and calculating the 95 percent confidence interval. Data quality objectives vary for precision depending on the results of laboratory analyses.

Accuracy is also evaluated using three methods: determining the ratio between sample results and known values of spiked samples; tests of significant difference; and calculating the 95 percent confidence interval. Data quality objectives vary for accuracy depending on the results of laboratory analyses.

Table 6.1 summarizes the results of statistical analyses conducted in 2009. As shown, three data quality objectives failed during the year. The failed sewer accuracy tests were mercury samples. The laboratory was unable to determine the reason for the discrepancy in results; consequently, similar accuracy tests will be performed in 2010. The storm water precision test parameters that failed were aluminum, chemical oxygen demand, and total suspended solids. The failures are most likely due to the heterogeneous nature of the storm water. As a follow-up for the failed tests, analytical results will be closely monitored in 2010 to ensure potential failures are identified early and corrections implemented, if needed.

**Table 6-1 Summary of Statistical Analyses, 2009**

Sample Medium	Completeness Test	Precision Test		Accuracy Test	
	Results	# of Tests	Results	# of Tests	Results
Wastewater (sanitary sewer)	100%	6	All passed	28	26 passed
Storm water	90% <sup>a</sup>	11	8 passed	--	--
Groundwater	56% <sup>b</sup>	1	Passed	--	--

<sup>a</sup>The low percentage of samples collected was due to an unusually dry year, not a failure of the sampling system. A nonconformance report was not required.

<sup>b</sup>The low percentage of samples collected was due to several wells being dry as a result of a drop in groundwater levels, not a failure of the sampling system. A nonconformance report was not required.

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- 10 Code of Federal Regulations (CFR) Part 830, Department of Energy, Nuclear Safety Management, Subpart A, Quality Assurance Requirements, Federal Register Vol. 66, Number 7.
- 10 CFR Part 1021, Department of Energy, National Environmental Policy Act Implementing Procedures.
- 40 CFR Part 61, Environmental Protection Agency, National Emissions Standards for Hazardous Air Pollutants, Subpart H – National Emissions Standards for Emissions of Radionuclides Other Than Radon From Department of Energy Facilities.
- 40 CFR Part 70, Environmental Protection Agency, State Operating Permit Programs.
- 40 CFR Part 82, Environmental Protection Agency, Protection of Stratospheric Ozone.
- 40 CFR Part 262.41, Environmental Protection Agency, Standards Applicable to Generators of Hazardous Waste, Subpart D, Record-keeping and Reporting.
- 40 CFR Part 403, Environmental Protection Agency, General Pretreatment Regulations for Existing and New Sources of Pollution.
- 40 CFR Part 433, Environmental Protection Agency, Metal Finishing Point Source Category.
- 7 United States Code (USC) §136, Federal Insecticide, Fungicide, and Rodenticide Act, 1972.
- 15 USC §2601 et. seq., Toxic Substances Control Act of 1976.
- 16 USC § 470, National Historic Preservation Act of 1966.
- 16 USC § 703 et. seq., Migratory Bird Treaty Act of 1918.
- 16 USC §1531 et. seq., Endangered Species Act of 1973.
- 33 USC §1251, Clean Water Act of 1977.
- 42 USC § 2011 et. seq., Atomic Energy Act of 1954.
- 42 USC § 4321 et. seq., National Environmental Policy Act of 1970.
- 42 USC § 6901 et. seq., Resource Conservation and Recovery Act of 1976.

42 USC § 6961, Federal Facility Compliance Act of 1992.

42 USC § 7401, Clean Air Act Amendments of 1990.

42 USC § 9601, Comprehensive Environmental Response, Compensation, and Liability Act of 1980.

42 USC §11001 et. seq., Superfund Amendments and Reauthorization Act of 1986, Emergency Planning and Community Right-to-Know Act.

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## 8 Glossary

Ambient air	The surrounding atmosphere, usually the outside air, as it exists around people, plants, and structures. It does not include the air next to emission sources.
Biochemical oxygen demand	A measure of the amount of dissolved oxygen that microorganisms need to break down organic matter in water. Used as an indicator of water quality.
Categorical process	An industrial process that discharges wastewater and is regulated under 40 CFR, Part 403.
Chemical oxygen demand	The amount of oxygen required to degrade the organic compounds of wastewater. Used to measure the overall level of organic contamination in wastewater.
Dose	A term denoting the quantity of radiation energy absorbed.
Dosimeter	A portable detection device for measuring the total accumulated exposure to ionizing radiation.
Effluent	A liquid or gaseous waste discharged to the environment.
Emission	A gaseous or liquid stream containing one or more contaminants.
Ephemeral stream	A stream that flows only for a short duration during and following rainfall.
External radiation	Radiation originating from a source outside the body.
Fluvial sediments	A sedimentary deposit consisting of material transported by, suspended in, or laid down by a river or stream.
Lacustrine sediments	Sediments formed in, or relating to, a lake.
Mixed waste	Waste that contains both radioactive and hazardous constituents.
pH	A measure of hydrogen ion concentration in an aqueous solution. Acidic solutions have a pH less than 7, basic solutions have a pH greater than 7, and neutral solutions have a pH of 7.
Riparian	Pertaining to, situated in, or adapted to living on the banks of rivers and streams.

Specific conductivity	Measure of the ability of a material to conduct electricity.
Strike-slip fault	A fault with horizontal movement along the break where slipping is parallel with the strike of the fault.
Thermoluminescent dosimeter	A type of dosimeter. After being exposed to radiation, the material in the dosimeter (lithium fluoride) luminesces upon being heated. The amount of light the material emits is proportional to the amount of radiation (dose) to which it was exposed.
Total dissolved solids	Solids in water that pass through a filter. A measure of the amount of material dissolved in water.
Total suspended solids	Solids in water that can be trapped in a filter. Solids can include silt, decaying plant and animal matter, industrial wastes, and sewage.
Transverse fault	A fault that strikes obliquely or perpendicular to the general structural trend of the region.

## **9 Groundwater Analytical Results, Well Completion Data, and Sanitary Sewer Analytical Results**

**Table 9-1 Results of Quarterly Groundwater Analyses at SNL/CA, 2009**

Date		Dichlorodifluoromethane µg/L	Chloromethane µg/L	Vinyl Chloride µg/L	Bromomethane µg/L	Chloroethane µg/L	Trichlorofluoromethane µg/L	Methylene Chloride µg/L	Trans-1,2-Dichloroethene µg/L	1,1 Dichloroethane µg/L	Trichloromethane (chloroform) µg/L	1,1,1-Trichloroethane µg/L	Carbon Tetrachloride µg/L	1,2 Dichloroethane µg/L	Trichloroethene µg/L	1,2-Dichloropropane µg/L
Detection limit		2.0	0.5	1.0	1.0	0.5	0.5	2.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
MCL - California				0.5			150		10	5		200	0.5	0.5	5	5
MCL - Federal				2				5	100		100	200	5	5	5	5
Well ID																
NLF-6	4/2/09	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.77	ND	ND	ND
	4/2/09 <sup>a</sup>	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.78	ND	ND	ND
	4/2/09 <sup>b</sup>	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AS-3A	4/2/09	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AS-3B	4/2/09	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AS-3C	4/2/09	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FM-1 <sup>c</sup>		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FM-7 <sup>c</sup>		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
AS-4	4/2/09	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trip Blank	4/2/09	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

MCL – Maximum contaminant level.

ND – Non-detectable.

-- Not required to analyze or sample not collected.

<sup>a</sup> Field duplicate sample.<sup>b</sup> Field blank sample.<sup>c</sup> Well was dry during 2009.

**Table 9-1 Results of Quarterly Groundwater Analyses at SNL/CA, 2009 (continued)**

Date	Bromodichloromethane µg/L	Cis-1,3-Dichloropropene µg/L	Trans-1,3-Dichloropropene µg/L	1,1,2-Trichloroethane µg/L	Tetrachloroethene µg/L	Dibromochloromethane µg/L	Chlorobenzene µg/L	Bromoform µg/L	1,1,2,2-Tetrachloroethane µg/L	1,3-Dichlorobenzene µg/L	1,4-Dichlorobenzene µg/L	1,2-Dichlorobenzene µg/L	8015-Diesel (w/silica gel clean-up) µg/L
Detection limit	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	50
MCL - California		0.5		32	5		30		1		5		
MCL - Federal	100			5	5	100	100	100		600	75	600	
Well ID													
NLF-6 4/2/09	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--
4/2/09 <sup>a</sup>	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4/2/09 <sup>b</sup>	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--
AS-3A 4/2/09	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AS-3B 4/2/09	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AS-3C 4/2/09	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FM-1 <sup>c</sup>	--	--	--	--	--	--	--	--	--	--	--	--	--
FM-7 <sup>c</sup>	--	--	--	--	--	--	--	--	--	--	--	--	--
AS-4 4/2/09	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trip Blank 4/2/09	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--

MCL – Maximum contaminant level.

ND – Non-detectable.

-- Not required to analyze or sample not collected.

<sup>a</sup> Field duplicate sample.<sup>b</sup> Field blank sample.<sup>c</sup> Well was dry during 2009.

**Table 9-1 Results of Quarterly Groundwater Analyses at SNL/CA, 2009 (continued)**

	Date	Antimony mg/L	Arsenic mg/L	Barium mg/L	Beryllium mg/L	Cadmium mg/L	Chromium mg/L	Cobalt mg/L	Copper mg/L	Lead mg/L	Mercury mg/L	Molybdenum mg/L	Nickel mg/L	Selenium mg/L	Silver mg/L	Thallium mg/L	Vanadium mg/L	Zinc mg/L	Tritium pCi/L
Detection limit		0.0005	0.0005	0.005	0.0005	0.00025	0.0005	0.0005	0.0005	0.0005	0.000012	0.0005	0.0005	0.0005	0.00019	0.0005	0.0005	0.005	210
MCL - California			0.01	1		0.01	0.05		1 <sup>d</sup>	0.05	0.002			0.01	0.05			5 <sup>d</sup>	20000
MCL - Federal		0.006	0.01	2	0.004	0.005	0.1		1 <sup>d</sup>		0.002		0.1	0.05	0.1 <sup>d</sup>	0.002		5 <sup>d</sup>	
Well ID																			
NLF-6	4/2/09	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	4/2/09 <sup>a</sup>	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	4/2/09 <sup>b</sup>	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
AS-3A	4/2/09	ND	0.0012	0.13	ND	ND	0.014	0.00070	0.0021	0.0033	0.000081	0.0039	0.0021	0.00056	ND	ND	0.0037	0.0069	ND
AS-3B	4/2/09	ND	0.00074	0.14	ND	ND	0.0090	ND	0.0015	ND	0.000059	0.0037	ND	0.00055	ND	ND	0.0023	ND	ND
AS-3C	4/2/09	0.0016	ND	0.082	ND	ND	ND	ND	0.0013	ND	0.000013	0.0032	0.00058	ND	ND	ND	0.0025	ND	ND
FM-1 <sup>c</sup>		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FM-7 <sup>c</sup>		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
AS-4	4/2/09	ND	0.0011	0.071	ND	ND	ND	ND	0.0025	ND	ND	0.0027	0.00068	ND	ND	ND	0.0022	ND	ND

MCL – Maximum contaminant level.

ND – Non-detectable.

-- Not required to analyze or sample not collected.

<sup>a</sup> Field duplicate sample.<sup>b</sup> Field blank sample.<sup>c</sup> Well was dry during 2009.<sup>d</sup> Secondary drinking water standard.

**Table 9-2 Well Depth and Screen Period Interval**

Area	Well ID	Well Depth (ft)	Screen Period Interval (ft)
Fuel Oil Spill Site	FM-1	106.1	90 – 105
	FM-7	108.56	96 – 106
Arroyo Seco	AS-3A	112.58	100 – 110
	AS-3B	124.97	118 – 123
	AS-3C	157	150 – 155
	AS-4	28.57	15 – 25
Trudell Auto Repair Shop	MW-406	94	87 <sup>a</sup>
Navy Landfill	NLF-6	110	87 – 102

<sup>a</sup> Start of screen interval. Length of screen interval is unknown.



**Table 9-3 Routine Monitoring Results for SNL/CA Sanitary Sewer Outfall, 2009**

		BOD <sup>c</sup> SM5210B	COD <sup>c</sup> (mg/L) E410.4	TDS <sup>c</sup> ( mg/L) SM2540C	TSS <sup>c</sup> (mg/L) SM2540D	Oil & Grease (mg/L) <sup>d</sup>	Cyanide <sup>d</sup> (mg/L) Kelada-01
Date	Laboratory ID # <sup>a</sup>	All results reported in mg/L					
January							
January 2	0801018-001	160	330	137	210	<i>f</i>	0.0069
February							
February 3	0903052	150	1700	1160	164	<i>f</i>	0.013
March							
March 3	0903060	240	490	266	331	<i>f</i>	0.016
April							
April 7	0904172	810	1200	272	580	<i>f</i>	0.017
May							
May 5	0905094	590	840	264	740	<i>f</i>	0.013
June							
June 2	0906078	660	510	268	290	<i>f</i>	0.013
July							
July 7	0907145	570	600	257	294	<i>f</i>	0.017
August							
August 4	0908054	390	600	265	384	<i>f</i>	0.015
September							
September 1	0909032	310	670	194	226	<i>f</i>	0.0086
October							
October 6	0910133	92	1100	311	270	<i>f</i>	0.0010
November							
November 3	0911077	100	1400	252	310	<i>f</i>	0.0011
December <sup>*</sup>							
December 1	0912022	270	300	297	159	<i>f</i>	0.0098
Discharge Limit <sup>b</sup>		N/A <sup>e</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>	N/A <sup>e</sup>	100	0.04

\* Site shutdown from December 25, 2009 through January 4, 2010.

<sup>a</sup>Analyses performed by an off-site, state certified laboratory.

<sup>b</sup>Discharge concentration limits, City of Livermore Municipal Code 13.32.

<sup>c</sup>Weekly composite sample. The dates indicate the day the sample was collected. The sample represents a representative composite for the previous week.

<sup>d</sup>Grab sample.

<sup>e</sup>N/A indicates not applicable; i.e., there is no specific discharge limit for this parameter.

<sup>f</sup>The monitoring requirement for oil and grease has been suspended until such time as the City of Livermore Municipal Code 13.32 can be modified to remove references regarding specific analytical methods effective May 3, 1999.

**Table 9-4 Routine Monitoring Results for SNL/CA Sanitary Sewer Outfall, 2009 (Method E200.8)**

		As	Cd	Cr	Cu	Pb	Hg	Ni	Ag	Zn
Date <sup>a</sup>	Laboratory ID # <sup>b</sup>	All results reported in mg/L								
January										
January 6	0901051-001A	0.0029	0.00055	0.0047	0.33	0.0042	0.00012	0.0047	0.0016	0.39
January 13	0901201-001A	0.0013	<0.00025	0.0014	0.13	0.00062	0.000043	0.0018	0.00019	0.082
January 20	0901330-001A	0.00065	<0.00025	0.0011	0.12	<0.0005	0.000032	0.0019	0.00035	0.10
January 27	0901536-001A	0.0017	0.00070	0.0039	0.47	0.0050	0.00033	0.0066	0.0019	0.48
February										
February 3	0902052-001A	0.0014	0.00074	0.0027	0.36	0.0045	0.00018	0.0068	0.0016	0.42
February 10	0902255-001A	0.019	0.020	0.33	5.6 <sup>d</sup>	0.27 <sup>d</sup>	0.00066	0.29	0.011	6.2 <sup>d</sup>
February 17	0902444-001A	0.0038	0.0028	0.037	0.93 <sup>d</sup>	0.037 <sup>d</sup>	0.00034	0.041	0.0027	1.1 <sup>d</sup>
February 24	0902647-001A	<0.02	<0.005	<0.005	0.28	<0.02	<0.0008	0.013	<0.005	0.43
March										
March 3	0903060-001A	0.0013	0.00043	0.0049	0.20	0.0057	0.000087	0.0085	0.00086	0.29
March 10	0903226-001A	0.0016	0.00047	0.0051	0.21	0.0047	0.00016	0.0064	0.00077	0.26
March 17	0903440-001A	0.0016	0.00059	0.0056	0.27	0.0058	0.00019	0.0067	0.0016	0.37
March 24	0903589-001A	0.0016	0.00035	0.0029	0.18	0.0035	0.000080	0.0044	0.00085	0.22
March 31	0903768-001A	0.0017	0.00042	0.0034	0.23	0.0045	0.00012	0.0037	0.00076	0.23
April										
April 7	0904172-001A	<0.0050	<0.0025	<0.0050	0.14	<0.0050	<0.00012	<0.0050	<0.0019	0.17
April 14	0904335-001A	0.0018	0.00052	0.0041	0.24	0.0040	0.00011	0.0040	0.00095	0.23
April 21	0904526-001A	0.0015	0.00042	0.0025	0.26	0.0030	0.00013	0.0035	0.00072	0.19
April 28	0904669-001A	0.0018	0.00039	0.0027	0.26	0.0037	0.000079	0.0037	0.00059	0.28
May										
May 5	0905094-001A	0.0015	0.00045	0.0027	0.26	0.0048	0.00012	0.0039	0.0012	0.28
May 12	0905228-001A	0.0014	0.00029	0.0018	0.15	0.0027	0.000075	0.0035	0.00071	0.23
May 19	0905365-001A	0.0014	0.00050	0.0027	0.17	0.0031	0.000078	0.0040	0.00055	0.22
May 26	0905513-001A	0.0020	0.00060	0.0029	0.42	0.0045	0.00012	0.0043	0.00082	0.28

**Table 9-4 Routine Monitoring Results for SNL/CA Sanitary Sewer Outfall, 2009 (Method E200.8) (Cont.)**

		As	Cd	Cr	Cu	Pb	Hg	Ni	Ag	Zn
Date <sup>a</sup>	Laboratory ID # <sup>b</sup>	All results reported in mg/L								
June										
June 2	0906078-001A	0.0016	0.00037	0.0020	0.31	0.0033	0.000070	0.0038	0.00067	0.23
June 9	0906304-001A	0.0021	0.00057	0.0033	0.45	0.0053	0.00013	0.0062	0.0014	0.38
June 16	0906487-001A	0.0022	0.00069	0.0032	0.58	0.0077	0.00035	0.016	0.0019	0.43
June 23	0906702-001A	0.0018	0.00047	0.0029	0.36	0.0048	0.00012	0.0071	0.00067	0.34
June 30	0906890-001A	0.0023	0.00056	0.0030	0.53	0.0057	0.00028	0.0084	0.0010	0.42
July										
July 7	0907145-001A	0.0019	0.00055	0.0071	0.47	0.0047	0.00040	0.0062	0.0017	0.40
July 14	0907321-001A	0.0018	0.00061	0.0040	0.34	0.0050	0.00014	0.0068	0.0012	0.34
July 21	0907537-001A	0.0022	0.00054	0.0024	0.47	0.0050	0.000094	0.0069	0.0016	0.34
July 28	0909729-001A	0.0031	0.0010	0.0046	1.1	0.0099	0.00018	0.012	0.0038	0.71
August										
August 4	0908054-001A	0.0017	0.00046	0.0022	0.33	0.0045	0.00072	0.0053	0.0014	0.32
August 11	0908248-001A	0.0016	0.00030	0.0013	0.18	0.0028	0.000044	0.0029	0.00062	0.21
August 18	0908457-001A	0.0024	0.00047	0.0026	0.33	0.0047	0.000077	0.0047	0.0010	0.26
August 25	0908615-001A	0.0018	0.00039	0.0017	0.28	0.0038	0.000067	0.0041	0.00097	0.26
September										
September 1	0909032-001A	0.0018	0.00040	0.0019	0.38	0.0037	0.000092	0.0041	0.0013	0.27
September 8	0909195-001A	0.0020	0.00047	0.0032	0.47	0.0040	0.00012	0.0049	0.0019	0.32
September 15	0909431-001A	0.0023	0.00077	0.0039	0.65 <sup>d</sup>	0.0074	0.00025	0.0073	0.0021	0.59
September 22	0909631-001A	0.0020	0.00066	0.0035	0.48	0.0062	0.00018	0.0083	0.0018	0.52
September 29	0909829-001A	0.0014	0.00041	0.0024	0.25	0.0034	0.000086	0.0037	0.0011	0.26

**Table 9-4 Routine Monitoring Results for SNL/CA Sanitary Sewer Outfall, 2009 (Method E200.8) (Cont.)**

		As	Cd	Cr	Cu	Pb	Hg	Ni	Ag	Zn
Date <sup>a</sup>	Laboratory ID # <sup>b</sup>	All results reported in mg/L								
October										
October 6	0910133-001A	0.0011	0.00026	0.0014	0.14	0.0019	0.000048	0.0025	0.00064	0.16
October 13	0910354-001A	0.0018	0.00056	0.0033	0.37	0.0054	0.00014	0.0048	0.0015	0.36
October 20	0910642-001A	0.0018	0.00052	0.0041	0.27	0.0070	0.000091	0.0053	0.0012	0.37
October 27	0910792-001A	0.0027	0.0010	0.0059	0.62	0.010	0.00025	0.0095	0.0029	0.68
November										
November 3	0911077-001A	0.0021	0.00063	0.0035	0.43	0.0063	0.00016	0.0059	0.0022	0.41
November 10	0911248-001A	0.0018	0.00054	0.0032	0.27	0.0049	0.00014	0.0048	0.0012	0.33
November 17	0911398-001A	0.0017	0.00052	0.0028	0.26	0.0042	0.00015	0.0052	0.0012	0.32
November 24	0911602-001A	0.0017	0.00078	0.0032	0.23	0.0052	0.00033	0.0040	0.00092	0.27
December*										
December 1	0912022-001A	0.0015	0.00033	0.0015	0.14	0.0023	0.00019	0.0025	0.00044	0.15
December 8	0912219-001A	0.0012	0.00040	0.0021	0.10	0.0026	0.000080	0.0034	0.00075	0.21
December 15	0912411-001A	0.0025	0.00083	0.0058	0.32	0.0062	0.00024	0.0057	0.0021	0.50
December 22	0912599-001A	0.0017	0.00062	0.0068	0.26	0.0050	0.00031	0.0062	0.0022	0.42
December 29	1001008-001A	0.0013	<0.00025	0.0029	0.16	0.0015	0.000052	0.0023	0.00049	0.12
Discharge Limit <sup>c</sup>		0.06	0.14	0.62	1.0	0.20	0.01	0.61	0.20	3.0

\*Site shutdown from December 25, 2009 through January 4, 2010.

<sup>a</sup> Samples are collected as a weekly composite.<sup>b</sup> Analyses performed by an off-site, independent laboratory.<sup>c</sup> Discharge concentration limits, City of Livermore Municipal Code 13.32.<sup>d</sup> Exceedences occurred on February 9 and 10 for copper, lead, and zinc. An exceedance for copper occurred on September 8.

## 10 Distribution List

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